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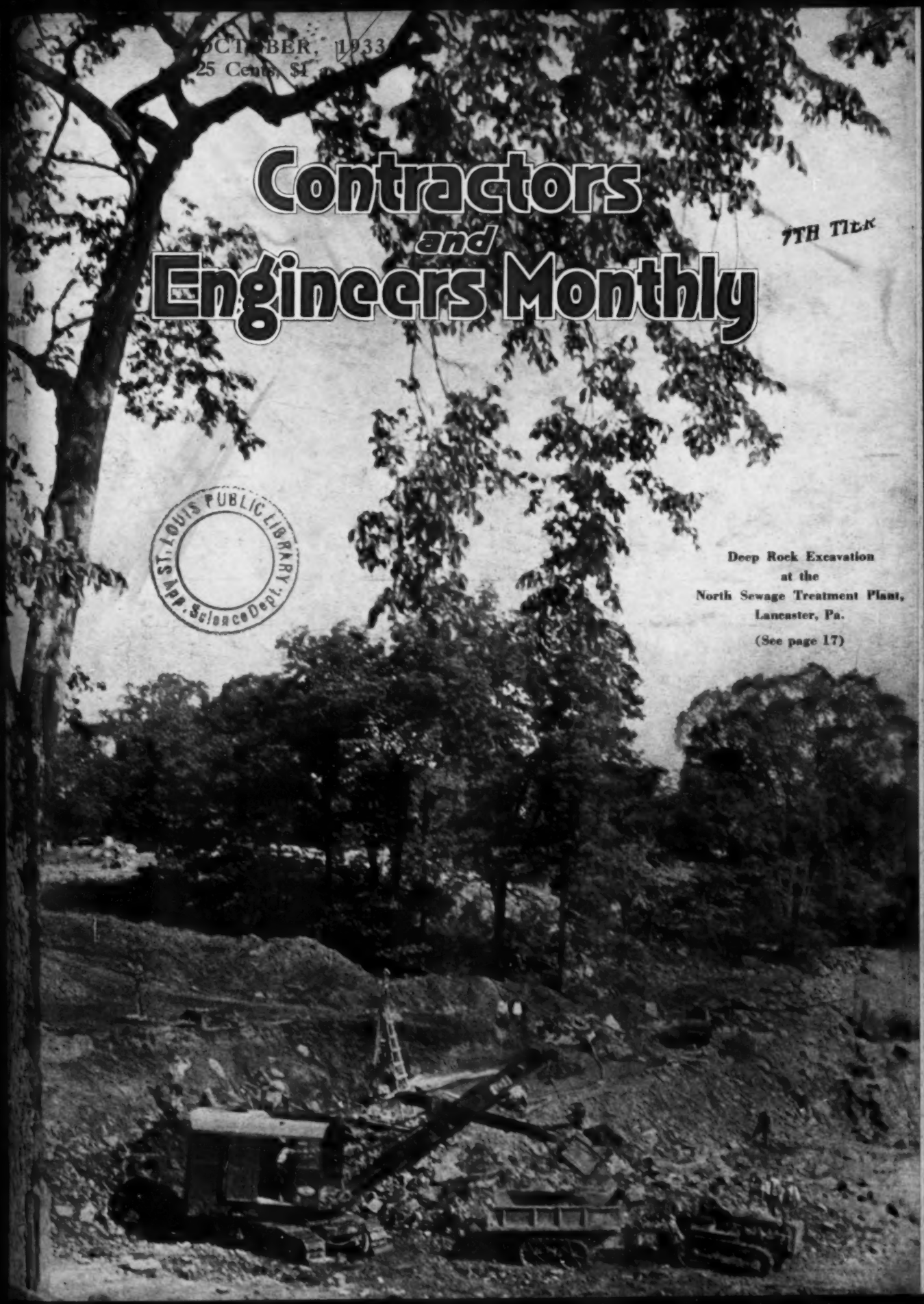
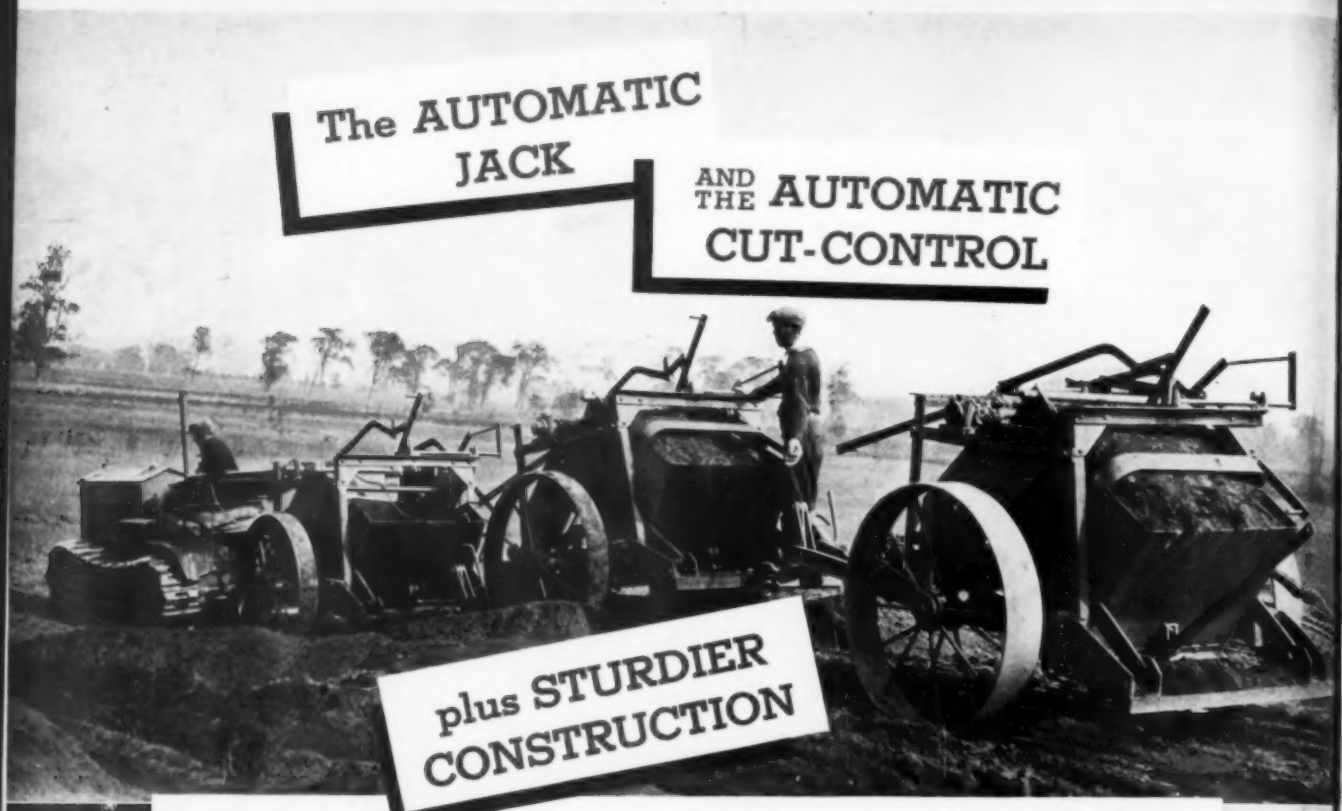


Deep Rock Excavation
at the
North Sewage Treatment Plant,
Lancaster, Pa.

(See page 17)

The AUTOMATIC JACK AND THE AUTOMATIC CUT-CONTROL



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THE EUCLID ROAD MACHINERY COMPANY
CLEVELAND OHIO

Paving Through Blow Sand

Where Sand Said to Trucks "You Shall Not Pass" Industrial Railway Carried On

WADING around in loose sand is not good for man or beast nor does it add to the life of construction equipment. Along the shores of Lake Michigan is a blow sand that piles into moving dunes much like the sands of Cape Cod or the shifting sands of the southwest. This territory in western Michigan is a great playground and continuous efforts have been made to open it to the citizen and tourist. Much progress has been made near the southern border where wide concrete pavements are now famous, and during 1933 the State Highway Department contracted for further work north of Ludington, Mich., on the Lake Shore Boulevard. This paving, 3.88 miles long, is 20 feet wide and has a 9-7-9-inch section.

Grading Must Progress Slowly

Fine grading must be held fairly close to the paving operations as a stiff wind can undo a day's work overnight in filling the grade between the forms. In one section ahead of the forms where there was a draw between two large dunes it took the grading crew of two teams and fresnos with drivers and helpers a day to pull back the sand that had blown off the grade overnight and left it low.

For form setting the contractor, H. C. Nelson of Muskegon, Mich., used three men and a foreman to set the Lakewood 9-inch forms. To shape the trench was merely a matter of scraping the sand to grade with a light touch of the shovel. This naturally meant that the forms were not as firmly set as one would wish, but by packing the sand beneath them and carefully resetting them just ahead of the paver they worked satisfactorily under the finishing machine. It was necessary to set a double header board when running the finishing machine out at night for washing it because the foundation of the forms was so unstable and the forms were likely to spread. All along the section paved, the forms were heavily banked with sand to add the maximum stability to the forms. The man who oiled the forms ahead of the paver also tamped the bases of the forms to get as firm a foundation as possible, and he also helped the grading crew.

Grading between the forms was not a job which called for a large number of men but it was necessary that the sand be pulled down to approximately grade level. This was done by a crew of three men with a team of horses and a strike-off board which was pulled over the forms three times by the team and the excess sand shoveled out each time by hand. Where low spots were encountered, sand was shoveled in by hand except, as noted above, where there was a great deficiency; then the fresnos were brought back.

Batching and Hauling

It was true that trucks could not pass, especially if carrying a heavy load. There was one truck on the job but that did not belong to the contractor. It was a State Highway Department truck and equipped with the super-balloon tires which made it possible to drive over the sand if some caution was exercised and no load carried. With this exception, and the truck which carried the bags of cement over the finished pavement from the freight siding to the spur of the industrial track where the bags were emptied, five to a batch, into the cement containers of the batch boxes, every bit of hauling was done by industrial railway equipment. May we be permitted another exception, the faithful and very well-groomed team that went back and forth

Striking Off the Sand Base

along the sand shoulder with a flat bed wagon hauling forms and burlap during the day.

The batching plant was set up on a railroad spur where the hopper-bottom and gondola cars of sand and gravel from the Hersey Gravel Co. were unloaded, either by dumping into a pit from the hopper-bottom cars or direct unloading from the gondola cars by the Northwest crane with a 1¼-yard clamshell bucket. All material was placed in a stockpile and then rehandled by the crane to the batching plants. A pair of Heltzel trailer bins was used for the two sizes of gravel and a Butler bin with a Johnson batcher for the sand. The industrial track produced by Sweet's Steel Co. was laid through the batching plants and beyond to another switch so that there was a complete loop around the plant.

The industrial railway equipment consisted of six gasoline locomotives, three 6-ton Milwaukee locomotives, two 6-ton Burton locomotives, and one 7-ton Plymouth locomotive. At the time this job was visited there were only three of the trains in service with an extra locomotive at the plant for shifting as needed. This made it necessary for the paver to stop periodically because the nearest switch was located at such a distance that fully ten minutes out of each hour was spent waiting for the next train to come up. This was overcome satisfactorily when the locomotives were all in use by periodically sending up a double header of two trains. The first was sent up before work started in the morning and served the paver during the time while the trains were clearing the switch nearest the paving. When this train was empty it went down to the plant for restocking. It was usually nearly noon when this was necessary so that the scheme overcame the trials of early operation. Ten-car trains, all of Lakewood industrial cars and batch boxes, were operated throughout the work. The two miles of track used was maintained by a crew of two to ten men as needed.

At the batching plant the trains were split after the gravel was loaded in all batch boxes. The locomotive then spotted five of the cars at the cement truck so that the cement containers could be filled while the sand was being loaded in the other five cars. The same men handled both gravel and sand at the two batching plants. As soon as the second half of the train was loaded with sand, the locomotive swapped the two sections and completed loading, then went back and was ready to start for the passing switch part way out to the paver. It took about 40 minutes to unload one 10-car train of 20 batches at the paver.

The operating crew at the batching plant consisted of two men in the aggregate cars cleaning up, one crane man, two men on the gravel and sand batchers, three men at the cement cars loading the flat bed truck, and three men unloading the cement into the cement containers. There were also three men shaking bags.

This job was operated on a 10-hour day with the two crews working alternately. Each crew worked a full day on Thursday, Friday, Saturday, Monday, Tuesday and Wednesday, thus completing one full week of work with a day of rest in the middle but still complying with the Federal regulation permitting a man to work only 30 hours in any one week. The second crew picked up the work on the next Thursday and worked its week.

WATER SUPPLY ABUNDANT

This contractor did not have to worry about a lack of water at hand for mixing, sprinkling and curing, for the lake was only a few feet away from the road most of the length of the contract. Water in abundance was very important for unless the sand was sprinkled immediately ahead of the paver to solidify the surface, the paver was likely to be in trouble itself.

The water supply was handled by three pumps. One pair was located near the south end of the job and consisted of a Barnes horizontal triplex pump with a Hercules motor and another vertical triplex with a LeRoi engine. Further north the supply was supplemented by an old vertical triplex of unknown vintage driven by a LeRoi engine. These pumps delivered to the water line which was laid on the west side of the pavement opposite the industrial railway track. The line was 2-inch throughout with taps for the paver and sprinkling hose every 270 feet. The paver carried 150 feet of hose.

POURING THE SLAB

With the well-sprinkled grade ahead of the paver ready for the concrete, the trains of batch boxes pulled up for three men to unload them. The individual batches, as made up at the batching plant, consisted of 885 pounds of each of the two sizes of stone, 1,005 pounds of sand and 5 bags or 470 pounds of cement. The short boom on the rear of the Multi-Foote paver was used to swing the Lakewood batch boxes around and dump them into the skip. The paver pulled a Ted Carr subgrade planer which cut the wet sand grade accurately to contour. Two men shoveled out the excess sand and took turns sprinkling the grade immediately behind the paver to insure the full value of the water of the batch to the concrete.

Two puddlers and a steel man all handled the concrete and shoveled to the strike-off of the Ord double-screed finishing machine. The steel man placed the 4-foot dowels of ½-inch bars at 20-inch intervals transverse to the center line of the pavement and 3 inches below the top of the slab. The dowels were carried in a metal container on the subgrade planer where they were handy to the steel man. A large stock of the dowels as well as expansion joints was kept on a flat car on the passing spur where they could be picked up by one of the trains as it came up to restock the material at the paver.

The Ord finishing machine carried a cutting wheel

for the center joint. Immediately behind the finisher was a Lakewood hand-operated machine belter used with a home-made rig for placing the center joint. The center joint material was premoulded in 5-foot strips 2½ inches wide and was set with ¼-inch out of the slab. The belter was rigged so that a double platform was available for the man setting the center strip. Thus he could face east or west, according to the sun. This arrangement or an awning of some sort over the entire machine is always found on all jobs where the contractor thinks of the comfort of his men. The machine also carried a cantilevered plank at the rear supported by three pipes and about 5 feet behind the machine so that any necessary work could be done behind the machine without disturbing the man setting center joint. Under this cantilevered plank the regular belter of the machine was used but raised so as to clear the center strip at the middle of the slab and not knock it into waves. A burlap drag was arranged behind this to take out all the marks of finishing across the center strip.

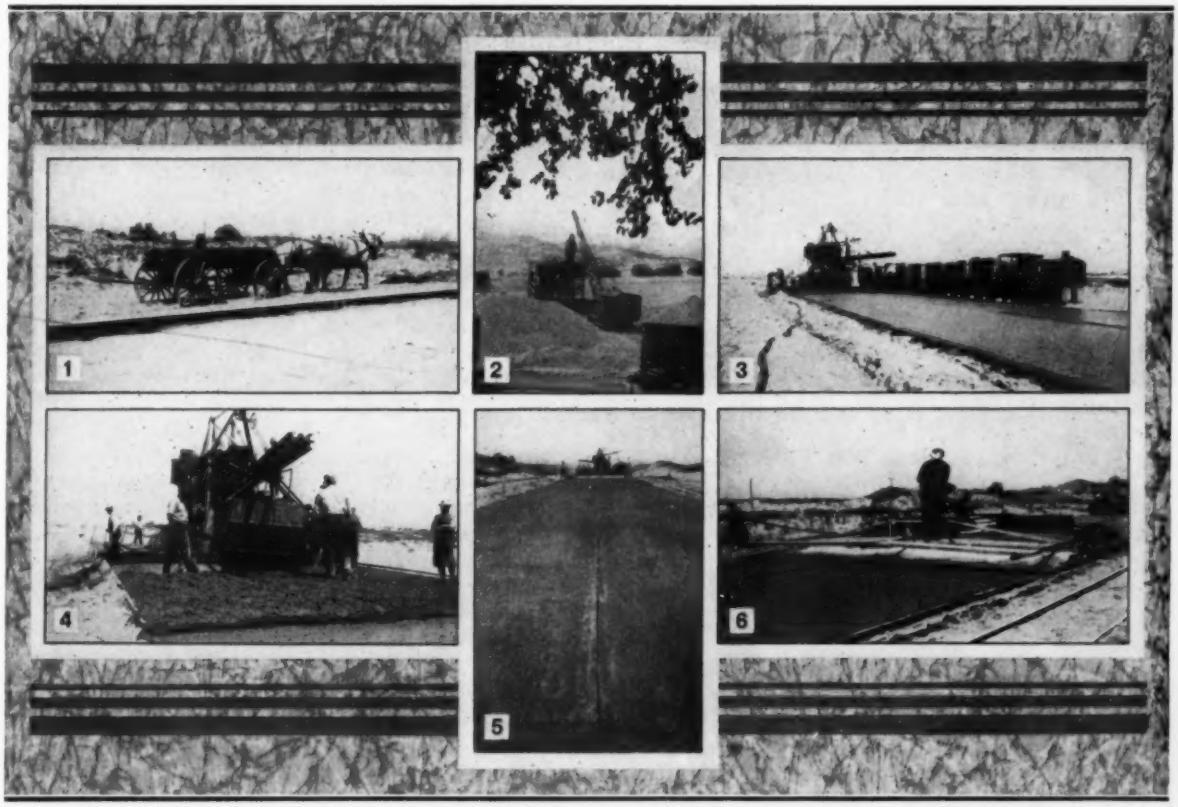
There were two hand finishers using 10-foot straightedges and two 10-foot box-type floats working behind the center joint man. They had a 4-wheel rolling bridge for easy access to both sides of the slab and for working on the expansion joints. The expansion joints were set in the slab at intervals of 100 feet, using Carey Elastite 1-inch premoulded expansion joint material. The joints were put in by the men working at the subgrade planer. This crew was able to pave an average of 600 to 650 feet of the 20-foot slab per day with the 5-bag batch. This was stepped up nearly 100 feet a day when the improved hauling conditions became available. The mixing time was 60 seconds per batch.

CURING

After finishing, the slab was covered with wet burlap as soon as it had set enough to take it without marking. This was omitted for a portion of the work, according to the concrete inspector, because of the very foggy conditions along this section of the shore which made it impossible for the concrete to set sufficiently before dark for the burlap not to mark it. On the morning following pouring, the burlap was removed and the slab covered with about 2 inches of dry sand and sprinkled for 7 days. These same men pulled the forms and banked the edge of the pavement.

PERSONNEL

This contract was handled through to completion by H. C. Nelson of Muskegon, Mich., for whom C. R. Peoples was Superintendent. For the State Highway Department, Harry Griffith was Project Engineer. This road, known as the Ludington State Park Highway, was officially opened on September 3 with appropriate dedication ceremonies.

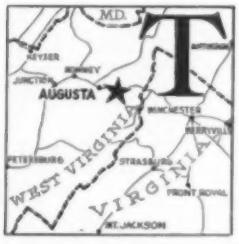


INDUSTRIAL RAILWAY EQUIPMENT LESSENED THE PROBLEMS OF PAVING OVER BLOW SAND
1. It required a sturdy team to pull the forms ahead. 2. The batching plant as seen from the hill with Lake Michigan in the background. 3. One of the industrial trains at the paver. 4. Spreading the concrete on the sand subgrade. 5. The straight center joint. 6. The hand-operated belter from which the center joint was set, showing the cantilever bridge and the burlap drag.

Contractors

Lay Hand-Napped Bases

in West Virginia



TELFORD was the great maker of bases for highways but he got his ideas from the Napoleonic roads with the hand-napped bases that have withstood the ravages of weather for many decades. There is nothing that will stand up under traffic better than the rock base that has been laid by hand and then broken down in place to furnish the coarser filling material. West Virginia realized this and at the same time saw a way to put a great number of her sturdy sons to work to earn the bread they needed and to take them off the relief rolls.

One of the projects on which this type of construction was used was located on U. S. Route 50 east of Augusta, W. Va., the contract for which was awarded to George N. & O. J. Yoho of Cameron, W. Va., for $100,727.01. This organization subbed the stone base and surfacing to Davis & Reynolds of Morgantown, W. Va. This project E-134 was 3.24 miles long, graded 30 feet wide, and with a 20-foot stone base. There were several large cuts in this stretch of excavation and one long high fill adjacent to the largest cut which eliminated a long and winding section of road. Beneath the fill was built the largest culvert in the state of West Virginia.

The Twin 6 x 8-Foot Concrete Box Culvert

A twin 6 x 8-foot concrete box culvert was built at Station 325+28 and is said to be the largest in West Virginia. This culvert was built under winter conditions requiring the heating of the aggregate and progress was so slow that it was feared that the contractor might be delayed in his grading. This culvert was the key to over 65,000 cubic yards of excavation, or 40 per cent of the total excavation on the job. The culvert itself is not of unusual design excepting the large amount of steel used which was necessary because of the extreme loading to which it was to be subjected. The height of the fill at the culvert is 60 feet and this entire fill was placed in layers of approximately 1 foot thickness, thoroughly compacted under a 10-ton roller. Fortunately the culvert was beside the old traveled road and, furthermore, required slight changes in the stream channel. Hence a normal flow of water was more readily controlled and kept away from the structure, although the run-off was at times of such volume as to flood the excavation and delay progress.

The Adjacent Cut

The material for the main body of the fill over the culvert was obtained from a cut just east of the culvert site. The cut was 1,300 feet long and the fill about 500 feet long. At its maximum center line the cut was 45 feet deep. This cut was removed in three separate lifts and during the first two lifts, the cut was of such width that it was possible to operate two shovels, one slightly leading the other. One shovel was a 1¾-yard Bucyrus-Erie 43-B and the other a 1¼-yard Northwest shovel. Some difficulty was experienced in the earlier stages of the construction of the fill to bring the material down to place it in layers, but this was accomplished by digging a winding hauling road which ramped down to the level of the culvert. During this excavation traffic was carried on the old road which led around the point of the hill and was of an oiled shale.

At the easterly end of the cut, the detour turned out onto the old road practically at grade, but at the westerly end it was necessary to bring traffic back up to the fill height along a ramp at the edge of the fill. This ramp was built up as the fill height was raised. The total length of the cut and fill was only 1,800 feet whereas the detour around the old road was 5,200 feet long. Hence the new alignment saved 3,400 feet of distance as well as eliminating two 60-degree curves, one 40-degree curve and other small curvatures. The saving in the cost of the base course alone, if constructed on the old alignment, was sufficient to compensate for a considerable fraction of the cost of the new grading. On the new grade there was one 2-degree curve and the maximum grade was 7 per cent, the same as on the old alignment.

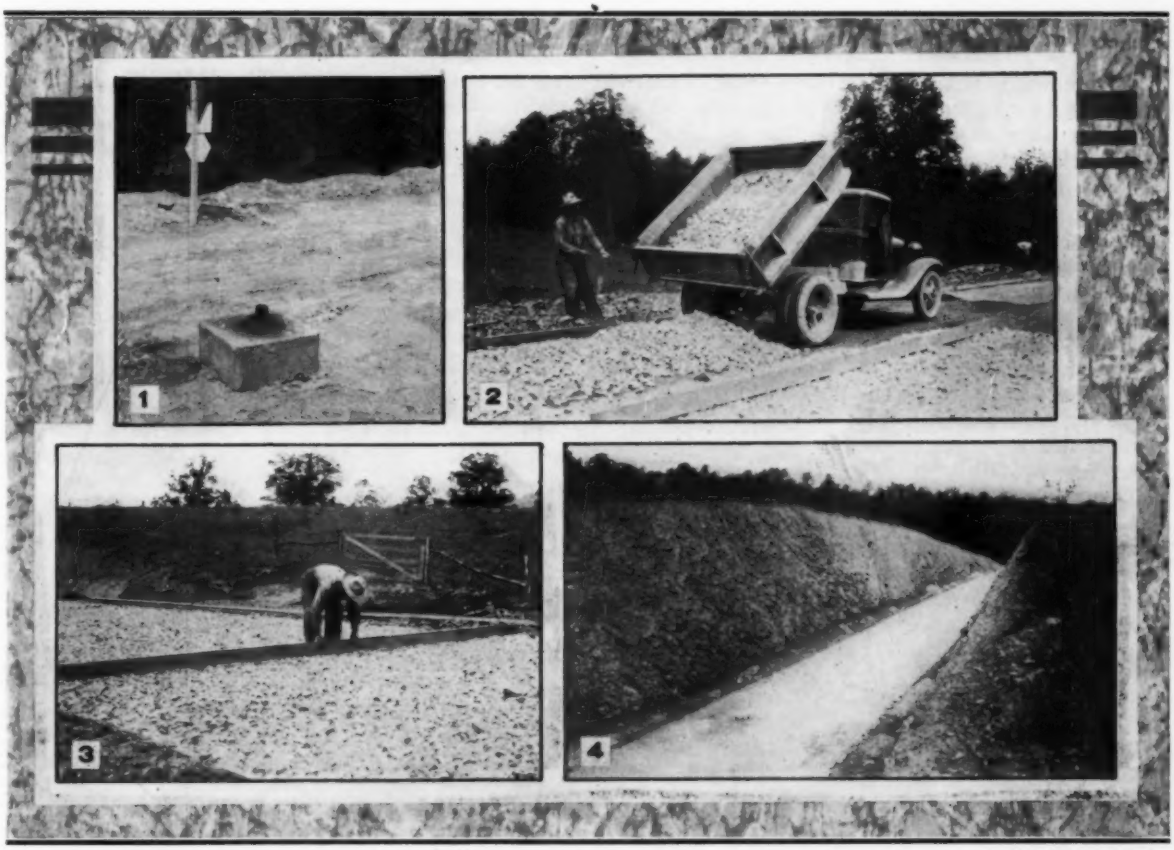
Placing the Stone Base

The stone base for this 3.24-mile project was laid in two courses. The base course was 6 inches compacted thickness of 5-inch stone and smaller, hand-napped on the road and rolled with a 10-ton Buffalo-Springfield

Unemployment Greatly Relieved by Contracts That Get Back to Fundamentals of Road Foundations

steam roller. This was immediately filled with sand and rock dust from stockpiles spread uniformly over the surface by hand. Following this, the contractor set forms along the edges of the paved road, using 2 x 4's about 16 feet long and staked at three places in each length. The forms were set on edge to give a full 3 inches compacted of No. 2 stone, passing a 3-inch screen for this course. This was spread from the tail gates of the trucks and carefully hand-picked to eliminate any rock which was too long to pack satisfactorily under rolling. This course was rolled and filled the same as the base course. The roadway was finally given a tar surface treatment in three applications. The base was primed with one-half gallon of 5 to 8-viscosity cold tar per square yard applied in two equal applications with chips up to 10 pounds per square yard on the second application where necessary either to prevent flow of the bituminous material or for the convenience of the traveling public. They were applied only in case the base could not immediately absorb the full quantity of tar. Following the priming, the balance of the surface treatment was given, using one-third gallon of 45 to 55-viscosity tar covering with 35 pounds per square yard of No. 8 grading limestone chips ranging in size from those retained on a No. 4 sieve to those passing a ½-inch square opening. A 5-foot shoulder was built on both sides of the new road surface both on fills and in cuts, with the ditches outside the shoulder in the cuts.

To insure equality of depth over the entire surface of the road, the contractor's men used 4-inch blocks set in the middle of the road while spreading the stone. The spreading and sweeping was handled by six to eight men but during the hand napping of the base course, the crew was many times larger. A 20-foot straight-edge of 2 x 6-inch plank was used both longitudinally



SPREADING THE UPPER COURSE OF THE STONE BASE ON U. S. ROUTE 50 IN WEST VIRGINIA

1. A bomb torch encased in concrete to reduce its attractiveness to fishermen. 2. Spreading No. 2 stone from the tail-gate of a truck. 3. Checking the stone with a 20-foot straight-edge. 4. One of the numerous large cuts, showing the upper base course in place.

and transversely to insure an even surface on super-elevated curves and grades. On tangents, the crown of the base course was 2 inches and all curves were super-elevated in accordance with West Virginia state standards. The maximum curve on the entire project was 6 degrees and this curve was elevated a total amount of 18 inches in its surfaced width or a rated elevation slightly less than 1 inch per foot.

QUARRIES

The surfacing contractor operated three roadside quarries, primarily for his production of stone for the hand-napped first course of the base. The largest of these quarries was at the west end of the job where a Climax portable crusher, bucket elevator and circular screen were installed. The rock face ran at right angles to the road and was drilled and shot so that the material could be loaded by hand into a shuttle truck which hauled the material to the hopper over the crusher jaws. The contractor operated four Ford and Dodge trucks hauling the crushed material from the quarry to the road. The major portion of the crushed stone for the top course was obtained from an additional roadside quarry located approximately ½-mile east of the job with a dead haul over paved road. In all the quarries the stone production was sandstone, but for the surface treatment cover limestone chips were specified and furnished, being hauled in by trucks from commercial quarries approximately 35 miles east of the project.

RELATIVE VALUES

An interesting note on the relative value of different items used on a road job might well be recorded here. Manufacturers of "bomb torches" or warning lights have called attention to the fact that they are of no value to the ordinary citizen who steals lanterns every time the watchman's back is turned; hence the bomb torches are safe and effective. Quite the opposite was the case in West Virginia for the contractor on this job reported that no less than seven of these torches were stolen during the first few days the bomb torches were put out to warn the traveling public that the road was detoured at certain sections. In order to prevent further losses, the contractor encased each circular torch in a rectangular block of concrete making a rather weighty "watch charm." Since then none of the warning torches have been disturbed. An interesting comment by J. R. McDermott, District Engineer, West Virginia State Roads Commission states, "Such lights are in great demand throughout the countryside for use in gigging and frog hunting and they make excellent camp illumination, and their disappearance was therefore not considered extraordinary by the engineering staff. It is a common practice either to cast a concrete base about these torches or to chain them to some inanimate object in order that they may be somewhat less invitingly displayed in isolated sections along the highway."

PERSONNEL

The excavation on this project was handled by George N. & O. J. Yoho of Cameron, W. Va., with "Red" Jones as Superintendent. On the surfacing the work was done by Davis & Reynolds of Morgantown, W. Va., with J. J. Reynolds and his son G. W. Reynolds, in charge of the laying of the material on the road and F. D. Davis and R. H. Davis in charge of the quarry operations. For the State Roads Commission of West Virginia, the work was done under the direction of J. R. McDermott, District Engineer, B. D. Johnson, Construction Engineer with C. A. Rude as Resident Engineer.

Special Equipment for the San Francisco-Oakland Bay Bridge

ONE of the outstanding engineering projects of all times is the construction of the San Francisco-Oakland Bay Bridge, work on which has already begun. This bridge, which will be the longest in the world, is financed as part of the Public Works program. It will be a double-decked structure of steel and concrete, with six traffic lanes for automobiles and light trucks on the upper deck and the lower deck will carry two interurban tracks and three lanes of traffic for heavy trucks. The two lower piers of the bridge will rise 505 feet above low water and extend 105 to 220 feet below low water. These towers are to be topped by airplane beacons and navigation lights for marine traffic.

This project has called for a large amount of special equipment, including an entirely new application of mixer bodies. Twenty-one specially-built Rex Moto-mixers, twenty-eight Rex-Stearns belt conveyors and a Rex supersize mixer for the central mixing plant have been built and shipped to the site of the work. The Moto-mixers are of 3½-yard capacity equipped with electric motor drive and are to be mounted in the hull of a fleet of barges, in groups of four or two in each barge. The barges are 105 feet long and 34 feet wide and when the units are in operation in the Bay, there will be seven complete barge plants, each carrying enough aggregate to provide the mixers with material for 20 to 40 batches each, depending upon whether two or four units are used. Each barge has 80 compartments for aggregate and each is equipped with a complete belt conveyor system, consisting of four Rex-Stearns belt conveyors, to carry the aggregate from the bins to the mixers and the finished concrete from the mixers in the hull to the deck of the barges and hence to the point of placement.

Accident Prevention an Economic Necessity

ACCIDENT prevention is no longer only a humanitarian movement, but an economic necessity which sooner or later will be practiced in every industry, H. W. Underhill of the Underhill Construction Co., Wichita, Kans., told the delegates to the Twenty-Second Annual Safety Congress.

"The sooner it is practiced in the construction industry," he said, "the sooner the contractor will be able to get lower compensation insurance rates. Lower rates will not come until it is practiced. Insurance companies operating in Missouri are seeking very large increases in compensation insurance rates in the construction industry and will probably get them. They are asking that the rate on sewer construction be raised from $14.21 per $100 of pay roll to $21.11; from $11.74 on bridge and culvert work to $16.74 and so on. Most contractors will find these increase rates not only obnoxious, but burdensome. They will feel that they can not pay them, and that they can not afford to hire a safety engineer.

"Innumerable instances are on record, however, of private concerns and in fact of whole industries which have been able to lower their accident insurance rates. Nearly every operation in the construction industry can be reduced in cost with safe surroundings.

"Accident prevention work is close kin to efficiency. There is just one way for contractors to get lower compensation insurance rates; and that is by reducing the number of accidents on their jobs. It has been done in other industries and it can be done in the construction industry."

Heavy Rock Excavation

for an Activated Sludge

Sewage Treatment Plant

Power Shovels

and Crawler Wagons

Handled All

of 40,000 Yards

of Material

TWO construction miracles happened simultaneously in Lancaster, Pa., in the early months of 1933. The City of Lancaster started a large public works construction program on its own without the assistance of the R.F.C. by selling $3,250,000 of its own bonds for the construction of two separate activated sludge sewage treatment plants and a water filtration plant, and the same contractor was low on both sewage treatment plant contracts. Thomas Burke & Co., of Philadelphia, Pa., moved equipment onto the jobs in February, 1933, and excavation began on the North Sewage Treatment Plant early in March.

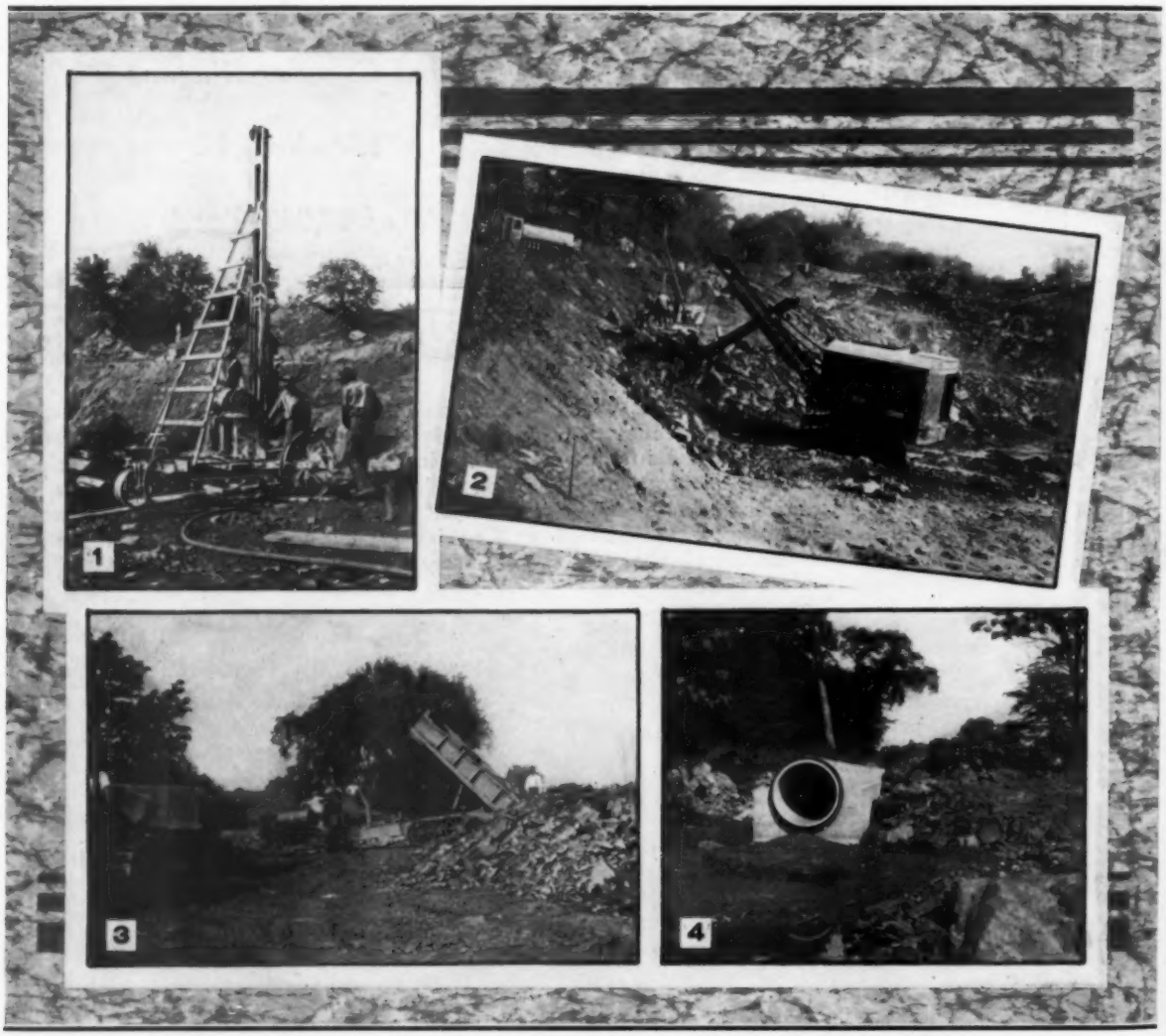
Outline of North Plant Project

The contract for the construction of the North Plant called for the laying of 1,550 feet of 42-inch reinforced concrete Lock Joint pipe with G-K asphalt joints from a new diversion weir built into the old Clay Street outfall sewer which is of brick construction and 10 feet in diameter. The new concrete pipe interceptor will take only the dry weather flow. The first structure in the system will contain the two screen chambers, each of which will be equipped with a Jeffrey automatic cleaning screen. An incinerator fired with gas from the sludge digestion tanks will dispose of all the screenings, grit from the grit chamber and the grease and skimmings from the primary tanks or any other tanks where such materials may develop.

Spreading the Broken Rock on the Dump

The sewage will then flow to the dual grit chambers in which will be installed Jeffrey scrapers for the removal of the deposited material. The next structure is the primary sedimentation tanks, which are rectangular, measuring about 68 x 90 feet, and are divided into two basins, each of which will be equipped with two flights of Jeffrey collecting devices for both sludge and scum which are to be carried to a pit. From here the scum will be carried to the incinerator and the sludge pumped to the sludge digestion tank. The activated sludge tanks measure 130 x 141 feet and are divided into three sections. The sewage thence will flow to the secondary settling tanks which will have three scraper sludge collectors similar to the primary tanks. The sludge from these tanks will flow to sumps in the main building and can be pumped either to the primary settling tanks, the activated sludge tanks or to the digestion tanks. The digestion tanks, of which there are two, are built with structural steel floating gas-collecting covers. The gas is to be used for heating the digestion tank, the buildings and for firing the incinerator. There are two sludge storage tanks connected with the digestion tanks so that the sludge may be held in storage during the winter or any other time when the weather is unfavorable for drying.

The effluent from the secondary settling tanks will flow to the sterilizing building where it is to be chlorinated before discharge into Conestoga Creek. The outfall sewer is a 36-inch reinforced Lock Joint pipe. The sludge will flow by gravity or may be pumped to the open sludge-drying beds which are to be equipped with narrow-gage industrial railroad track and cars for the removal of the dried sludge. The track will be carried along the beds to a retaining wall and the dried sludge will be dumped from the wall for storage and for removal by farmers who may want to use it for humus and fertilizer. An interesting bit of design is the forethought in planning to use the chlorinated effluent from the sterilizing house for watering the grounds through a sprinkler system, thus conserving the public water



HEAVY-DUTY EQUIPMENT WAS NECESSARY TO HANDLE THE METAMORPHOSED LIMESTONE

1. The wagon drill handled steel up to 32 feet long. 2. One of the shovels clearing a face preparatory to loading the shattered rock into the 3-yard crawler wagons. 3. Dumping the rock on the spoil pile. 4. The 42-inch reinforced concrete pipe laid in a concrete cradle.

supply. The pipe connections between the sludge digestion tanks, the sludge storage tanks and from the other structures are all to be in a tunnel built of concrete and with average dimensions of 7 feet high x 4 feet 9 inches wide. This will carry not only the sludge pipes but the hot water pipes for heating the sludge digestion tanks and the gas pipes from the digestion tanks. All electric lines throughout the plant will be laid under ground in fiber conduit.

DRILLING AND BLASTING

As the 40,000 yards of excavation for the North Plant was about 70 per cent rock, the drilling and blasting was an important part of the preliminary work. The overburden of earth varied from 10 to 18 feet thick and the faulted limestone was filled with mud seams which were a decided hindrance to drilling. The limestone was stratified and somewhat metamorphosed, showing distinct quartz crystal formation in many places. The drill men characterized the limestone as "bastard," a strictly technical term applied to any rock which does not behave in truly orthodox fashion.

There were four portable compressors on the job, two Ingersoll-Rand and two Chicago-Pneumatic, with eight jack hammers, and an I-R wagon drill which handled drill steel up to 32 feet long. The holes run with the jack hammers were from 8 to 10 feet deep. All shooting was done with 70 per cent gelatine du Pont dynamite. Shots were fired as frequently as three times a day for the small shots and the larger ones about once a week.

The total excavation for both plants was 100,000 cubic yards of material, about 75,000 yards of which was rock.

HAULING OUT THE SPOIL

The going was so rough in the excavation that the use of trucks was out of the question. The contractor resorted to crawler equipment, using eight Caterpillar Thirty tractors with Athey 3-yard crawler wagons. On the dumps a Caterpillar Sixty with a LaPlant-Choate hydraulic bulldozer spread the rock which could not have been handled economically in any other manner. The haul for the crawler equipment averaged 650 feet with the maximum around 1,000 feet.

The loading equipment consisted of two P & H shovels of 1 and 1¼-yard capacities with Waukesha motors, and a Northwest crane with a 40-foot boom and a 1-yard Owen clamshell. This was used for cleaning up in the various excavations after the shovels had handled the heavier work. The clamshell was equipped with Amsco manganese teeth and clips as any other type of teeth broke or wore out too rapidly handling the broken rock. The average output of the two shovels was 800 yards of rock a day when working regularly. During the early part of the job wet weather shut the work down for periods as long as a week each, after which it was necessary to pump out the excavation before the shovels could return to work. Three pumps were used to dewater the job, a 6-inch centrifugal, a 6-inch Lawrence Vortex centrifugal and a Marlo Mud Hen. One of the centrifugals was all that was needed to take care of the ground water, and the others were held in reserve and for handling surface water after storms. The pumps discharged through 12 and 18-inch terra cotta tile permanent service lines which will care for the surface water in the completed plant.

Bert Senior, Superintendent

MISCELLANEOUS EQUIPMENT

A small galvanized iron shop was erected at one end of the job for the master mechanic and all repairs to equipment centered about that building. It was fully equipped with all hand tools necessary and a Milburn acetylene torch for welding and cutting in making repairs. The greasing guns for the tractors and crawler wagons were stored at the shop. Outside were blocks for handling the dismantled tractors and wagons.

A group of eight Oxweld-Acetylene carbic flares were spread over the job to take care of illumination for any night work or repairs to machines which could not be moved to the shop.

The Rex 27-E paver which was used to mix the concrete for the job was stored at the repair shop when not in use, as was the Aeroil asphalt kettle which was used for the G-K compound for the joints in the interceptor. Concrete for the cradle of the reinforced concrete interceptor was supplied by the Ready-Mixed Concrete Co. of Lancaster, Pa.

LUBRICATION AND GASOLINE SERVICE

For the Wisconsin motor of the Northwest crane the operator used traction oil supplied by the Atlantic Refining Co. and changed it every week. Sinclair No. 3 cup grease was used throughout in all cups. The Atlantic tank truck visited the job every morning and supplied the equipment, filling every tank. When running full time, the job used between 500 and 600 gallons of gasoline a day. An emergency storage of gasoline was maintained in 55-gallon drums mounted on a framework near the shop.

LUMP SUM BIDS FOR THE NORTH PLANT

Excavation and grading for all structures	$52,577.00
Substructures	108,618.00
Superstructures	47,648.00
Intercepting sewer	8,100.00
Water main	1,100.00
Piping	26,871.00
Sludge beds	10,000.00
Roadways and walks	3,646.00
Diffuser plates	7 000.00
Gas holders	5,000.00
Incinerator	3,000.00
Cranes	1,300.00
Fence	700.00

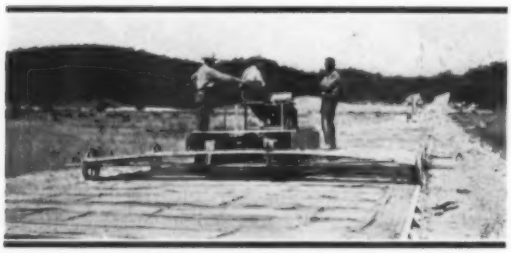
THE SOUTH PLANT

Methods of construction at the South Plant were practically identical to those used at the North Plant and excavation for this plant was not started until after it was completed for the North Plant, so that the same equipment could be used for both parts of the project. The excavation for the South Plant is now complete and concrete has been poured for the North Plant.

(*Continued on page 30*)

A New "Flying Cheese Box"

Form Carrier Made Initial Bow on Thomas, Bennett & Hunter Contract . at Oldtown, Md.



The Novel Form Carrier

A SUPERINTENDENT on a Maryland concrete road job has put an end to the hauling of forms on flat wagons through Squire Jones' orchard and Widow James' flower bed. Then, too, the squeeze play is not necessary when working through heavy cuts or beneath the high ledge and a river a few feet from the outer edge of the pavement. J. B. Fink, Superintendent for Thomas, Bennett & Hunter on a contract at Oldtown, Md., last year sprang a clever idea in a form carrier. This machine, which has fully as much beauty as the famous "flying cheese box" in which one of the Wright Brothers made the first heavier-than-air flight, has already shown its ability to perform other services.

Before describing this machine in detail let us consider how it was used. The Superintendent sent out ten men at 3 A.M. to pull the forms from the previous day's run. These were stacked on the form carrier which ran on the remaining forms. At the end of a day's run the paver and finisher were moved about 100 feet down the forms away from the completed slab. This left room for the form carrier to run beyond the slab close to the finishing machine and unload the forms on the shoulder at a point which would be ahead of the paver when it returned in the morning to begin pouring. The forms were then loaded on a utility truck which ran up the grade and carried them ahead to the form setter. This machine was also used by the burlap men in the daytime to carry burlap forward. One of the accompanying illustrations shows the three bur lap men starting back on the form carrier for a load of burlap. Ten forms can be piled on either side of the engine on the carrier. Inasmuch as the forms weigh 172 pounds per 10-foot form when clean and with the usual accumulation of dirt and concrete weigh nearly 200 pounds each, it can well be seen that the form carrier serves a very useful purpose and is a "god-send" when a road runs through a series of cuts or is squeezed through on a shelf of rock above a river.

The form carrier was powered by a Model T Ford engine using the differential so that it ran readily around curves. It was built with a White truck drive sprocket and chain and had a brake and a very clever widening device so that it could be used on roads from 18 to 20 feet wide. The widening device consisted of a threaded rod with a loop in the outer end which held two 12-foot spring leaves in the ends of which were slotted holes for the axles. When widening the track gage it was necessary only to slack off on the nut on the threaded rod which permitted the wheels to drift out to the greater width of road on the steel forms. The spring leaves always kept the single flange wheels snug against the outside of the steel forms. To prevent damage to the concrete the wheel flanges were on the outside instead of the inside of the forms. The extension axle had a slotted key way and a collar and set screw so that the wheels could be set up tight on the axle at any desired width of span. The platform on which the forms were stacked consisted of six 2 x 12-inch planks each with a turnbuckle. The planks rested on a 4 x 6 angle on either side with the short leg upright as illustrated.

Fine Grade and Form Setting

As the rough grade on this project was prepared under another contract, the contractor was able to start in immediately preparing the fine grade with a crew of sixteen laborers, one man with a Warco road hog and one man on an Allis-Chalmers 10-ton steam roller. The Road Hog was used to cut the grade 2 feet wider than the 18-foot road to leave a clear space in which the form setters could work. The subgrade was prepared with a crown of 2 inches and the completed slab with a crown of 1⅛ inches, giving the slab a cross section of 9-6½-9 inches. The subgrade for this job was

a broken shale which drained so well that within 10 minutes after a heavy rain, it was dry enough to pour concrete.

The Heltzel 9-inch forms with an 8-inch base were set by one form setter and a helper with three laborers, two of whom were used to drive pins following the actual bringing of the forms up to line and grade. Another man in the same crew scraped the tops of the forms clean and oiled them.

Batching Plant

Sand and stone for the batches were brought in by truck and rail. The rail shipments were unloaded by a Byers crane with a 50-foot boom and a ¾-yard Blaw-Knox bucket direct to the bins of the Blaw-Knox batching plant. The stone was supplied by the Spring Gap Quarry, and was hauled by truck to a stockpile adjacent to the batching plant. Inasmuch as this quarry was also supplying another job to the west of the Thomas, Bennett & Hunter contract, it could not furnish aggregates in sufficient quantities until the first contract had closed; hence the supplementary rail shipments. All of the sand was shipped in by rail by the Cumberland Cement & Supply Co. of Cumberland, Md. The individual batches were made up with 1,882 pounds of stone and 1,352 sand for a 6-bag batch. The cement was not loaded on to the batch but was emptied into the skip of the paver, after having been stored on cement boards along the shoulder. The cement was received in bags in box cars at some distance from the batching plant, loaded on to flat bed trucks and hauled to the grade, requiring the services of a crew of about five men. One man just ahead of the paver carried the cement boards ahead and also attended to covering the base of the forms with dirt to prevent concrete which might be spilled over the edge of the forms adhering to the base and increasing the weight of the forms and shortening their useful life.

The batch hauling fleet consisted of four 4-batch trucks and five 2-batch trucks on the long hauls and one 4-batch and four 2-batch trucks on the short hauls. The batch trucks because of their weight turned through spaces in the forms instead of using a turntable. One man at the paver skip handled the dumping of the batches and also acted as oiler and helper for the paver. A crew of five men cut and dumped the cement into the paver skip while one man baled the empty sacks. In order to maintain a uniform routine in dumping the six bags in the skip, one man dumped two bags and the four others each dumped one bag of cement. The crew shifted places daily so that one man did not carry the extra burden throughout the job.

The Concreting Crew

The Rex 27-E paver was oiled as needed by the helper who, with the operator, greased it at the end of each day. The paver pulled a Koehring trail grader with a scratchboard and scraper. A crew of five men was carried on the final grade back of the paver using the testing board, sprinkling the grade and rolling it with a 500-pound stone roller.

As the individual batches of concrete were dumped two puddlers between the forms spread them uniformly. Outside the forms there were two spaders and two men who shoveled extra concrete and grout to the strike-off of the Ord finishing machine. This finishing machine had the new Blaw-Knox widening device for increasing the width of the span of the wheels around widened curbs for 16 to 20-foot roads. The machine used by this contractor is the first used on construction work for standard widths over 10 feet. The paver was operated 11½ hours a day, pouring an average of 900 feet of slab 18 feet wide and with a 9-6½-9-inch cross section.

Transverse Joints and Center Joint

Dummy transverse joints were placed every 40 feet and a continuous center strip or ribbon was placed by a Heltzel Cleft-Plane machine which was pulled by the finisher. Two men worked from the Cleft-Plane machine. First thing in the morning before they started placing joints, they went out and spotted the stakes for the spacing of the 40-foot dummy joints. They also carried a short peg to mark the front limit of the placing of the center joint paper on each run forward as they were pulled ahead by the finishing machine. The space for the paper was cut by a wheel at the front of the Cleft-Plane machine which parted the aggregate and made the insertion of the paper an easy matter for the two men on the machine.

Finishing and Curing the Concrete Slab

Two finishers with two helpers used 10-foot drag straight-edges on the slab to remove any transverse ripples. The helpers brought back grout in galvanized iron pails from the finishing machine to fill against the forms where the double-flange wheels of the Heltzel Cleft-Plane machine had left a track.

The finishers used a 2 x 1-foot long-handled float to work out high spots in the slab and to fill in any low places. A Lakewood aluminum 10-foot straight-edge was used for checking the slab ahead of final finishing which was done with a 12-inch canvas belt with a wood plank bow to keep it taut. The edging of the slab was done by two men who also placed the burlap which was carried in 36-inch x 20-foot strips on a Carr rolling bridge. In order to avoid hair checking of the concrete the burlap was thoroughly wet down before placing it on the bridge. After placing, the burlap was continuously sprinkled to keep it damp until its removal the following morning by the three burlap men who also used the checking straight-edge to locate any high spots in the slab. If any were found they were removed with a Berg surfacer. As soon as the pavement was accepted

The Concreting Unit from Batch Truck to Finishing Machine

by the inspector the silicate of soda solution was applied by the burlap men. A 2-wheel rubber-tired hand truck was used for moving the drums of silicate of soda around and thus facilitated its application to the day-old concrete.

WATER SUPPLY

Water for the entire project was furnished by a Barnes triplex pump through a 2-inch pipe laid along the shoulder. The paver carried 150 feet of U. S. Rubber Co. hose and the taps for the paver hose were inserted at 200-foot intervals.

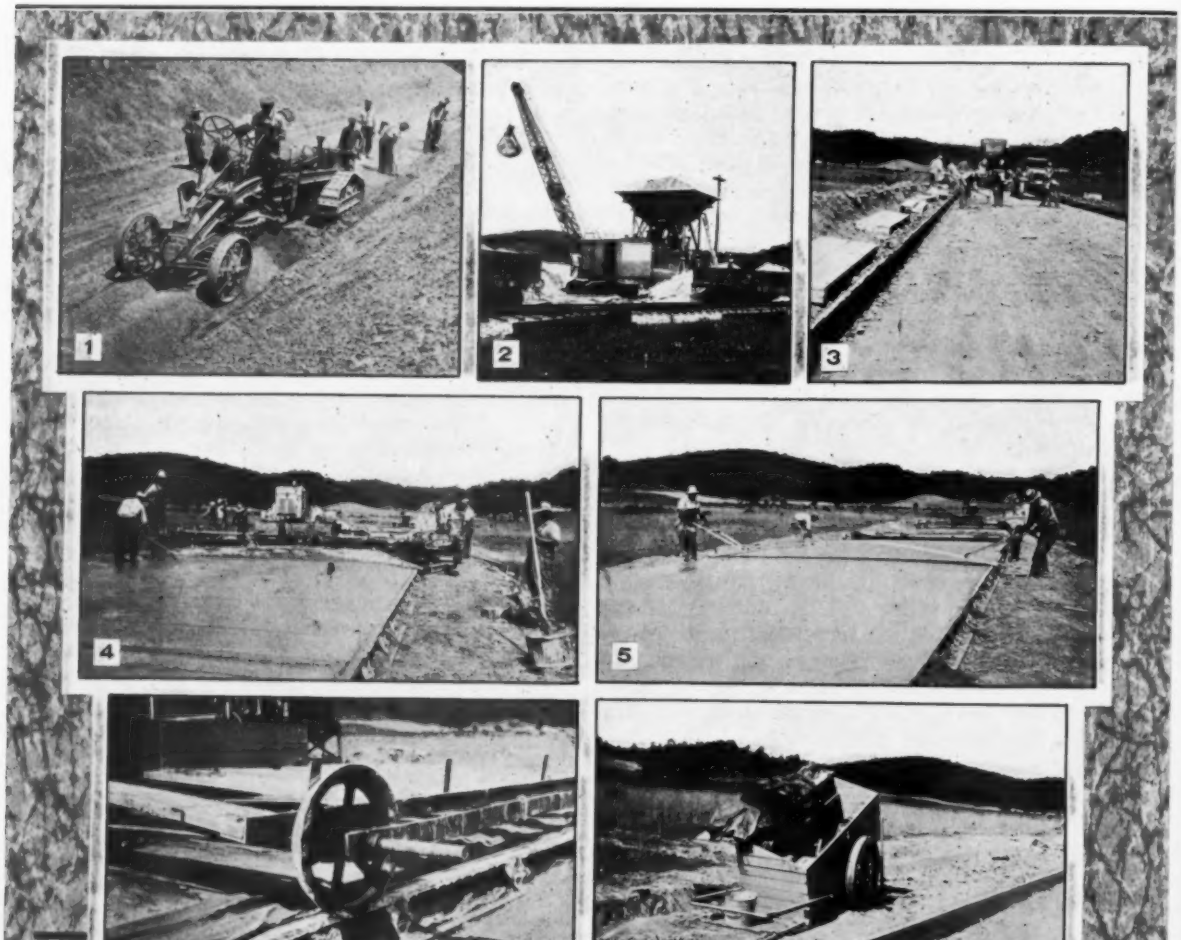
PERSONNEL

The contractors for this 12-mile paving project were Thomas, Bennett & Hunter of Westminster, Md., for whom J. B. Fink was Superintendent. For the Maryland State Roads Commission, Donald S. Brown was Chief Inspector.

Procedure Handbook of Arc Welding Design and Practice

THE recent publication of the "Procedure Handbook of Arc Welding Design and Practice" has made available in one volume a complete and up-to-date reference work on both the design and procedure for arc welding. The volume, which contains 434 pages with about 500 illustrations, is divided into eight principal parts or sections, each of which deals with an important phase of arc welding and its application. It is prepared not only for the use of all welders and departmental heads of welding departments but also for those responsible for the design of products which may be built by welding. The eight sections of the book cover the following subjects: Welding Methods and Equipment; Technique of Welding; Welding Procedure, Speeds and Costs; Structures and Properties of Weld Metal; Weldability of Metals; Designing for Arc Welded Steel Construction of Machinery; Design for Arc Welded Fabrication of Steel Structures; Typical Applications of Arc Welding in Manufacturing Construction and Maintenance.

This book is published by the Lincoln Electric Co., Cleveland, Ohio. Price, postpaid: $1.50. Foreign postage, $.35.



PAVING NEAR OLDTOWN, MD.

1. A one-man grader putting the finishing touches on the fine grade. 2. The batching plant layout. 3. Cement boards set out along the shoulder. 4. The finishing machine showing the widening device. 5. Using the low belt. 6. A close-up of the widening device on the form carrier. 7. The form setter's tool box.

Batching Aggregates *and* Cement *for a* 4.987-Mile Indiana Paving Project

Vinton Construction Co. of Coldwater, Mich., Made the Most of Small Space at the Cement Dock

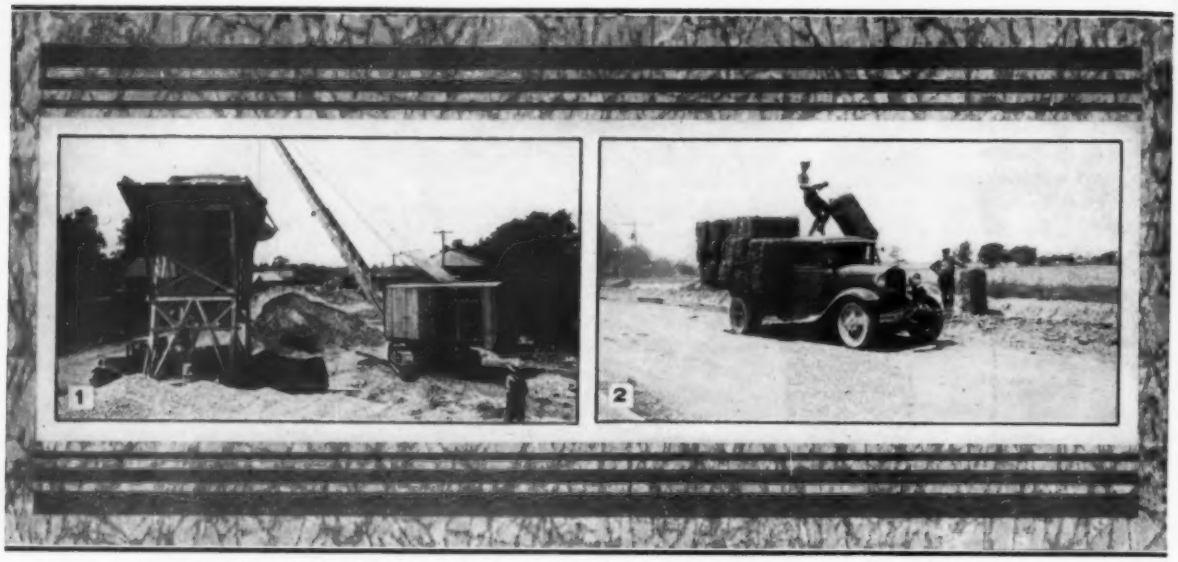
WHEN we visited this contract it was "Be-Kind-to-Birds-Week" in Hadley, Indiana, for resting on the cross-bracing of the Johnson aggregate bins just above the batchers was a robin's nest with three eggs in it. The mother bird had completed the nest before the work on the road started and when the men came to operate the batching plant, was loathe to leave. She flew close by at short intervals and when the batcher operator was busy she would actually go to the nest. It is a happy commentary on the character of the men working on this contract that the nest was not disturbed and the mother bird permitted to come at night and sit on the nest and hatch her brood.

A little-used spur track at Hadley, Ind., provided the location for the aggregate batching plant and the cement dock. The latter had to be located in a confined space between the spur track and the road but it was accomplished satisfactorily with a little sacrifice of comfort for the men working on the dock. The unloading platform was long enough to permit working from two cars at one time and would have been about 2 feet wider had the space permitted. As it was, the depressed roadway for the batch trucks would not permit another inch of runway width.

The cement batches were made up in containers made from old oil drums. These were enlarged with a 6-inch collar on top to permit the cement to be loaded and dumped without spilling. For moving them loaded from the cement car to the Gaston scales located in the center of the runway, the contractor devised 2-wheel trucks with arms which fitted the axles on the drums and picked them up just enough to clear the floor when moving. The 1¼-inch axles were located at about one-third the height of the barrels from the bottom and were reinforced with cleats of strap iron which hooked under the bottom of the drum and extended just above the axles. The axles were run through these cleats; thus the bottom of the drum carried most of the load and prevented tearing the metal of the drum itself. Where the cleats went through the bottom of the drum, it had to be calked with burlap to prevent leakage of cement.

Six men on the dock rolled the drums back to the cars after they had been dumped by two men, and filled and wheeled them to the scales, weighed them and moved them to the proper dumping hole. The scales had a grating for the platform so that there was not the usual accumulation of cement which gathers when cement batches are made up and corrected by the men to secure the proper weight.

There were two dumping holes in the dock, one for the trucks that carried regular cement containers of the Harm type, and the other for the trucks which carried oil drum containers similar to those used by the contractor for batching the cement. These were supported on A frames riveted to the bed of the truck and the barrel tipped with the dumping of the batch. The hole for loading to the barrel containers was a wooden box lined with sheet metal, the bottom of which was con-



PREPARATION FOR TWO IMPORTANT ACTIVITIES IN CONCRETE PAVING

1. The batching plant with the cement dock shown in the background, below the crane boom. 2. Spotting the bales of hay along the shoulder for curing.

stricted with old inner tubes from trucks. A stop on the frame of the dumping hole caught the axles of the cement barrel and the two dumpers turned it over readily. Most of the weight was taken by a 2½ x 2½-inch angle iron across the hole. The hole dumping to the cement containers of the Harm variety was the same as the first but had a canvas chute which fitted into the center portion of the container and permitted the air to be released through the two outer sections.

A man equipped with an aspirator worked below the dock on a plank runway, covering the containers by turning over the lid and the cement barrels by slipping a canvas cover over the top. This cover was attached to the barrel by a wire so that it would not be lost at the paver. The dock itself had a canvas roof to protect the workers from the sun.

Aggregate Batching

The batching plant, located about 400 feet from the cement dock and on the same spur track, had two pits for the unloading of the sand and gravel from the hopper-bottom cars. The aggregates were supplied by the American Aggregates Corp. of Indianapolis, Ind. They were unloaded to the bins of the Johnson batching plant by a Northwest crane with a 40-foot boom and a Williams 1-yard clamshell bucket. This track handled up to twelve cars of aggregate and five cars of cement a day with one switching.

The individual batches consisted of 1,320 pounds of sand, 2,332 pounds of gravel and 703 pounds of cement. The operating crew at the batching plant consisted of a crane man, two car cleaners, and the batch man. The batches were hauled by 24 one-batch trucks, all individually owned and paid by the batch hauled. The maximum haul was about 6 miles.

The Hadley railroad station was rented by the contractor as an office. A 100-foot well with a hand pump alongside the office provided an adequate supply of cold water for the workers on the cement dock and batching plant during the hot weather of June.

On the Grade

Preparation of the grade was handled by a Blaw-Knox wagon grader which took out high spots and brought back dirt to fill the low spots ahead of the form setting. High spots were first broken up with a Lakewood grade-rooter pulled by the same Caterpillar Twenty which handled the wagon grader and the Adams 8-foot grader which trimmed up the fine grade ahead of the forms.

Form setting was handled by three man on either side per shift, followed by fourteen men working on the grade with shovels and picks as required. Two men farther back lined up the forms on either side, and three men of the grade crew with a team hauled forms forward. Some of the grading crew was taken back each morning to pull forms and bank the edge of the slab. Six men spent the mornings spreading straw over the previous day's run after the burlap had been removed and the pavement straight-edged by the inspector. The straw was spread so that it would be at least 3 inches deep when wet.

Placing the Concrete

The batch trucks turned through the forms at a convenient distance from the paver and backed to the skip. The marginal bars for the reinforcing were spotted on the brackets of the 9-inch Metaforms after oiling. This put them where it was easy to get them for placing, where they were not in anybody's way and where they would be clean and not covered with dirt when it came time to concrete.

Two men dumped the trucks and cleaned up the material spilled on the grade. The new Rex 27-E paver had a 25-foot boom installed so as to cut the number of moves necessary in a day and also to leave the pit clearer for a greater length of time for the placing of the center steel. The paver pulled a Carr subgrade planer from which two men shoveled the dirt. These same men also set the marginal bars which were 30 feet

long and ¾-inch in diameter, set 4½ inches from the bottom of the slab and 6 inches in from the forms with stamped metal chairs. The section of the 20-foot slab was 9-7-9 inches. The contractor experienced 19 days of rain at the start of his work which greatly delayed the development of his organization of green men.

Back of the planer and pulled by it was a final scratch template to show up any high spots in the grade just before the concrete was placed and thus prevent any penalty from insufficient thickness of the slab. There were only two puddlers and one spader who also set the Kalman center steel and dowels, using a wooden gage for the center steel. Both dowels and pins for the center joints were carried on the paver while the center steel itself was strung along the shoulder ahead of paving by the utility truck. The paver carried an extra wooden guide for the placing of the center steel.

Next came the usual finishing machine. This contractor used an Ord with double screeds and a belt which was used on the second pass over the green concrete. There were two finishers, using 5-foot floats with bamboo handles to give greater delicacy of touch in handling the floats and to lighten them. The floats were followed with a 10-foot drag straight-edge, one on either side. This completed the finishing except for the edging of the slab and cross finishing with a 10-inch canvas belt. Two burlap men placed the wet burlap from a 4-wheeled burlap bridge, using burlap bagging stitched into the proper lengths.

WATER SUPPLY

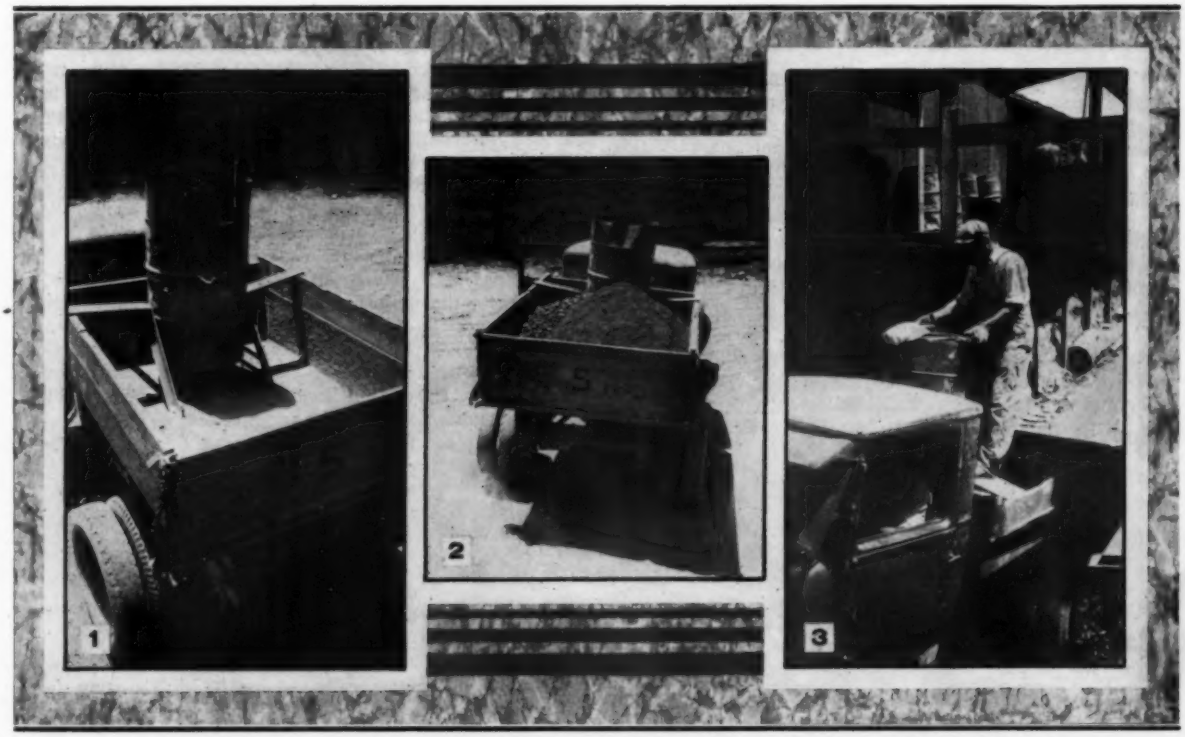
Water for sprinkling and for the mixer was furnished by a C.H. & E. triplex pump delivering to a 2½-inch pipe line laid along the shoulder. Taps for the paver hose was placed every 300 feet and the paver carried 175 feet of 1½-inch hose.

LABOR

According to the Federal regulations stating that no man shall be allowed to work more than 30 hours per week on emergency relief projects, the term "week" refers to a pay week which does not necessarily coincide with a calendar week. In this case the pay week ended on Wednesday so it was permissible for the contractor to work one crew a full 6-day calendar week of 10 hours per day and then alternate them with a second crew for the next calendar week. This method of meeting the Federal regulation proved to be more efficient in many ways than changing the crews every day.

PERSONNEL

This work of the Vinton Construction Co. of Coldwater, Mich., which extended from Groveland, Ind., to one mile east of New Winchester, Ind., was sublet to this company by the Berns Construction Co. to which the contract was awarded and which handled the rough grading. For the Vinton Construction Co. the work was in the immediate charge of W. U. Vinton and Carl Vinton. For the State Highway Commission the work was under the direction of M. R. Keefe, District Engineer until his appointment as Chief Engineer at which time Walter Irick was appointed District Engineer and the work was completed under his supervision. H. H. Morgan was Project Engineer.



THE METHOD OF HANDLING THE BATCHES BY THE VINTON CONSTRUCTION CO.

1. The cement containers were supported on structural steel trunnions with braces to prevent side-sway. 2. Pulling out from the batching plant with the sand and gravel. 3. The man beneath the cement dock covered the container with a canvas cap.

An Index of the Cost of Highway Construction

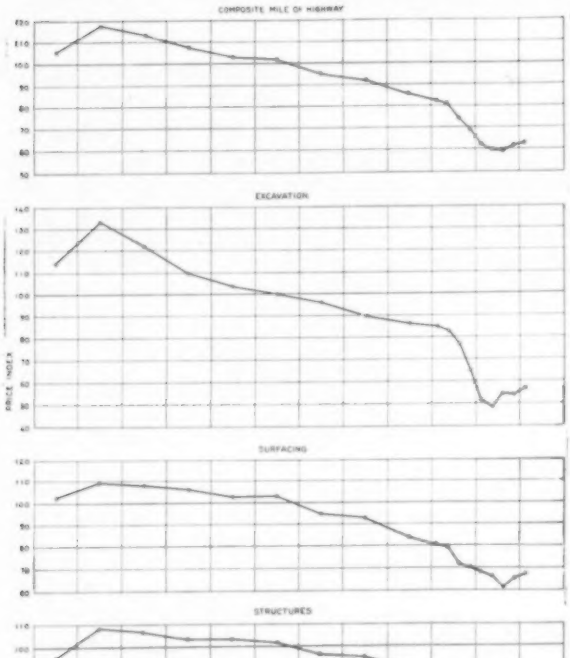


Figure 1, Showing the Price Trend in Highway Construction from 1922 to 1933, with Averages for 1925 to 1929 Taken as Base.

IN order to place a comprehensive statement of the relative purchasing power from year to year of the funds made available for highway construction at the disposal of those responsible for the determination of policy in this field, and of others who may be interested, the Division of Management of the U. S. Bureau of Public Roads has prepared indexes of such construction. These indexes show the trend in unit prices for excavation, surfacing and structures over the period of 1922 to 1933 and a similar price trend for a "composite mile" of road. It is well known that the quantities of materials and the amount of work required to build one mile of road have gradually increased during the last dozen years. The usage index shows this trend. Since the price index is based on the same quantities of excavation, surfacing and structures each year, it does not give a true picture of the variation in the cost of road construction. The cost index takes usage into account, and therefore shows the trends in actual cost per mile.

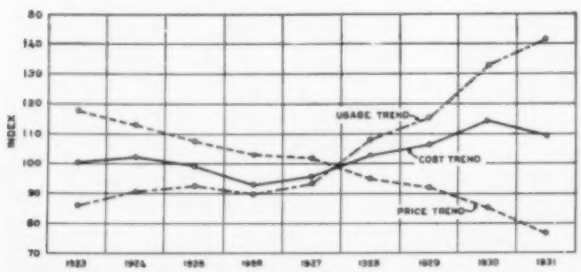


Figure 2, Showing Variation of Indexes of Highway Construction Cost from 1923 to 1931. The Cost Index, Taking Account of Usage, Shows Trend in Actual Cost Per Mile.

The results of this study show that unit prices for highway excavation, surfacing and structures declined steadily from 1923 to the second quarter of 1932. Since that date a definite upturn in unit prices has been noted. The combined effect of these trends is shown in Figure 1.

The quantities of work and materials required per mile of highway have increased almost continuously during the years from 1923 to 1931. The variation of the usage index, which gives the trend in the cost of a composite mile of highway, on the assumption of constant unit prices, is shown in Figure 2.

The cost index, which takes into account both the decline in unit prices paid for excavation, surfacing and structures and the increasing quantities of these items used per mile, is also shown in Figure 2. Between 1926 and 1930 the cost trend was upward. In 1931 the decline in price levels was felt sufficiently to cause a drop in the cost index as compared with that of the previous year.

Novel Wood Assembly Methods Reduce Construction Costs

A REVOLUTIONARY method of making wood joints through the use of metal connectors, strengthening timber at its critical points and thereby making it available for wider use in construction, is forecast in a handbook "Modern Connectors for Timber Construction" issued by the National Committee on Wood Utilization, U. S. Department of Commerce, and prepared jointly by engineers of the Committee and of the Forest Products Laboratory, U. S. Forest Service, Department of Agriculture. This new method should be of particular interest to highway contractors and engineers because of its possible application to timber bridge construction for second and third class roads and for construction trestles.

The connectors which are employed in this system consist principally of metal rings, plates and discs, of a dowel or semi-dowel type with teeth on one or both faces. These connectors are placed or forced into the faces of the wooden members to be joined. The members are then brought together and held by the usual bolt, but the bolt becomes primarily a binder and only secondarily a load bearing unit. With their larger circumference, these connectors take an increased load and distribute it over a larger area of the timbers.

There are some sixty odd types of connectors used abroad, of which some six or eight are considered important to American practice. Following are some of the examples of the varied types of structures in which modern connectors have been used in timber joining: The Saengerfest Halle, Vienna, for grand concerts, occupying five acres of ground and accommodating 75,000 persons; Westfalen Hall, Dortmund, Germany, a 250-foot free span bridge; a concrete pouring trestle, Bleiloch Dam, 680 feet in length with 83-foot spans, and the Roald Amundsen Dirigible Hangar, Spitzbergen.

"Modern Connectors for Timber Construction" is a 147-page handbook describing the connectors and their use and may be obtained at 15 cents per copy from the Superintendent of Documents, Government Printing Office, or the National Committee on Wood Utilization, U. S. Department of Commerce, Washington, D. C.

The Seventh International Road Congress

THE seventh International Road Congress, under the auspices of the Permanent International Association of Road Congresses, will meet in Munich, Germany, from September 3 to 8, 1934. The Road Building Exposition will begin on September 4 and is expected to last for fourteen days. Following the Congress, trips of inspection will be made and a final meeting will be held in Berlin on November 16 or 17, 1934.

Canvas Pipe Used for Temporary Sewer Line

In Replacing a Sewer Under Load, Construction Difficulties Were Overcome in Novel Manner

THE New Jersey State Highway Department recently completed a small but very interesting and difficult sewer replacement job where the construction of a highway circle at a three-point intersection caused an existing sewer to cross the highways several times. A sanitary sewer conveying the effluent of the Merchantville sewage disposal plant to Coopers Creek followed along one road to its intersection with two others, where a 60-degree angle was made to allow the original sewer to pass along one of the intersecting roads. The new highway improvement made it necessary to relay the sewer line so that the highway would cross it a minimum number of times. As some cut and fill was necessary, reducing the cover of the line in several places, it was decided to install cast iron pipe in this section.

The diameter of the original line was 20 inches, and it was replaced with 20-inch DeLavaud centrifugal cast iron pipe in 12-foot lengths with lead joints. The character of the soil was good, being a sandy clay, so that the difficulties incident to trenching and cover were reduced to a minimum. The chief difficulty involved in the replacement lay in the fact that the original line was operating full under a slight head. Although the gradient was sufficient to provide adequate flow and was uniform, and although Coopers Creek was the location of the outfall and there was no back pressure, the volume handled set up a noticeable pressure on the line. The sewage flow varied from hour to hour and amounted to about 1,000,000 gallons per day. It was considered inadvisable to interrupt the flow for more than 3½ hours, of which time it took 1½ hours to drain the line to such a point that it was possible to work on it. This

Rolling a Length of Pipe into the Trench

permitted the engineers to have a time limit of 2 hours for completely cutting over the line, during which time a considerable flow of pipe drainage had to be taken care of.

The State Highway Department specifications call for the construction of manholes at sanitary sewer intersections and at major turns. Accordingly a manhole was constructed at the intersection of the new cast iron line with the existing original line on the upper end and another at the lower end. These manholes were built large enough to enclose completely both the old and new lines.

The difficulty incident to cutting over the sewage flow from the old to the new line was a problem which was solved in an interesting manner by W. Sharpe, Engineering Inspector of the Department. A canvas pipe 8 feet long and 20 inches in diameter was made by triple stitching the heaviest available canvas to form a tube. This canvas pipe was rendered workable by keeping it wet, as it is well known that dry canvas is stiff and difficult to manage. Since it was a difficult engineering feat to devise a suitable elbow to connect the original line with the new cast iron pipe line and it would be more difficult yet to install this elbow in the manhole in the time limit of 2 hours, the use of a readily adaptable canvas pipe made a difficult job easy.

CUTTING OVER THE FLOW

When the zero hour was reached and the original line was drained, the crew set to work to cut over the flow into the new cast iron by-pass. The part of the original line in the manhole was removed, the canvas sleeve was slipped over the original sewer pipe and held fast by a strong leather belt pulled tight. The lower end of the sleeve was inserted into the cast iron pipe into which it projected for about 4 feet. It was decided not to use a canvas sleeve in the lower manhole as the original line would effectively drain this manhole.

As soon as the flow was resumed, the pressure within

Pouring the Joints in the Cast Iron Sewer Line

Caulking a Joint in the Cast Iron Sewer Line

the canvas sleeve forced it out into a circle and the portion extending into the cast iron pipe was forced so tightly against the metal wall as to make it impossible to pull it away with any tool short of a crowbar. The brick masons then went to work and surrounded the canvas sleeve with bricks and mortar, leaving only the top exposed. When this masonry had set, the canvas sleeve was cut away and the water was permitted to run through the masonry trough unimpeded. The manhole covers were put in place and the job was complete.

SCOPE OF THE PROJECT

The specific work described involved about 250 feet of pipe but the entire job required the use of about 5,000 feet of cast iron pipe in sizes up to 30-inch. At one section of the job the pipe was laid across a small stream on piles which had previously been driven for a detour bridge. These piles were sawed off to the correct length, were capped and were used to shore up the pipe line at this point. Subsequently when more piles were to be driven in this basin, considerable doubt was expressed as to whether the original piles would be forced up and thus cause leaks in the line due to the impact of the pile hammer. This did not occur, however, and the line remained tight.

PERSONNEL

This sewer job was performed under the supervision of J. A. Williams, Division Engineer, New Jersey State Highway Department, with Elmer Packer as Resident Engineer. The cast iron pipe was furnished by the U. S. Pipe & Foundry Co.

Among the articles scheduled for publication in the November issue of CONTRACTORS AND ENGINEERS MONTHLY *is one of particular interest. It describes the creating of Lake Springfield, involving the construction of an earth-fill dam, a concrete spillway bridge and a dividing dam at a low point in the divide between the valley of Sugar Creek and the south fork of the Sangamon River, as part of a new water supply project for Springfield, Ill.*

Special Forms

for

Standard Bridge Rail

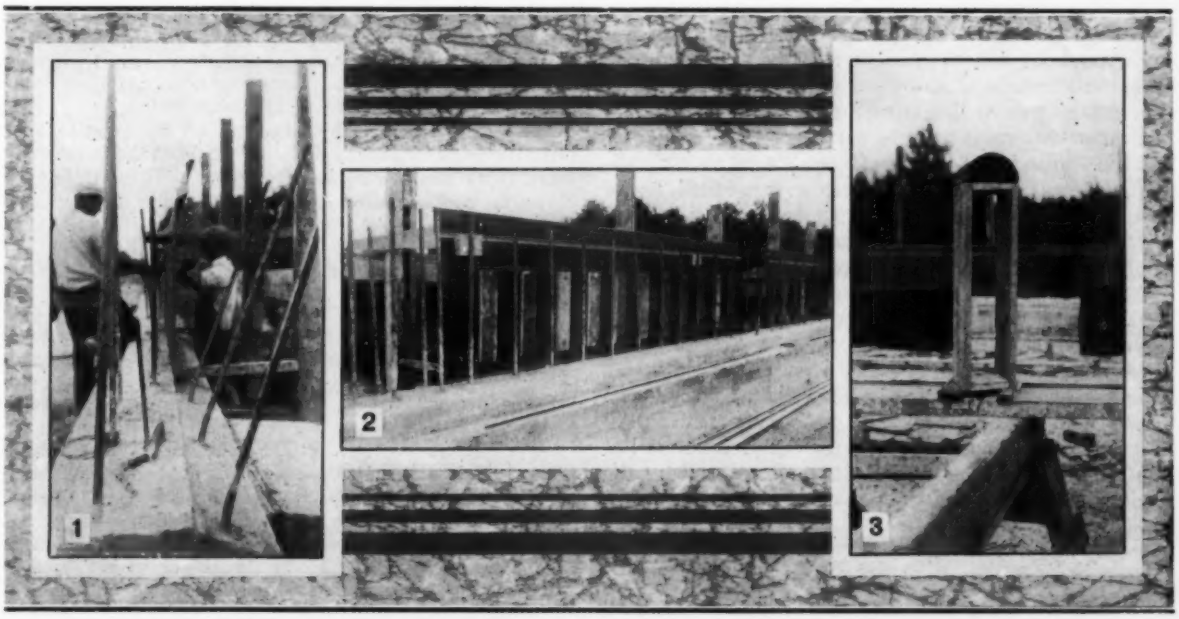
Charles I. Hosmer, Inc., of Greenfield, Mass.

Has Time-Saving Sheet Metal Forms

With Panels Adjustable to Grade

FOR several years the Department of Public Works of Massachusetts has standardized on a certain panel for all concrete bridge rails. This has made possible the use of an ingenious set of sheet steel bridge rail forms developed by Charles I. Hosmer of Charles I. Hosmer, Inc., who specializes in bridge construction. Sheet steel in variable lengths from 7 to 14 feet, the height of the bridge rail and 3/32-inch thick has been formed so that the posts and spindles can be cast in panels in place on the base. The top of the sheet steel is bent at right angles to the vertical section to act as a stiffener and along the bottom edge a 2 x 2-inch angle is welded to stiffen the form. The top bend, in addition to stiffening the form, also acts as a guide for a specially designed steel screed which forms the flattened inverted V of the top rail.

As described so far the sheet steel forms would be all right for a solid bridge rail but the Massachusetts rail



SOME DETAILS OF THE SHEET STEEL FORMS USED BY CHARLES I. HOSMER, INC.

1. Setting one of the sections. An end view of an outer plate showing the way it is bent to form the rail and spindles. 2. A front view showing the boards over which the boxes are placed to form the openings between spindles. 3. One of the boxes.

has separate spindles and posts. These are formed in an ingenious manner by inserting wooden boxes with circular tops to form the spaces between the spindles. Holes for bolts are drilled through the sheet steel on 12-inch centers horizontally, and 16½ inches vertically. Bolts inserted through these holes hold ¾-inch boards over which the wooden boxes are slipped. The boxes are made up as shown in the illustration with a bottom which can be easily broken to remove the box and with a top of a hardwood semi-circular section. These are used for many pourings but the bottoms of the boxes are broken out whenever the forms are stripped in 24 hours. If they are allowed to remain for 5 or 6 days, the boxes can be tapped out readily without damage. The boxes are oiled before being inserted over the boards on the sheet steel panel.

If the bridge is on a grade it is only necessary to bore the bottom hole in the boards slightly off center to give the proper angle to the board so that it will be vertical when the forms are set up on the bridge rail base. The top hole remains in the same place and the bottom of the board is swung as necessary. No new holes are drilled in the sheet steel, the only change being made in the location of the bottom hole in the board which acts as a guide for the boxes.

Five Richmond spreaders at the top and Universal form clamps at the center and bottom hold the forms tightly and prevent leakage of grout into the boxes which form the openings between the spindles. Separate wood or sheet steel sections are used for the posts or the regular forms can be butted and the panels made continuous. Mr. Hosmer uses two sets of 2 x 6-inch stringers or wales along the outside of the forms at about one-third and two-thirds of the distance from the base of the rail, held in place by the form clamps. These line up the forms continuously.

A 355-YARD POUR ON THE TAUNTON RIVER BRIDGE

A 121-foot concrete bridge 45 feet wide from curb to curb was built over the Taunton River as part of the Taunton-Middleboro cut-off during the summer of 1933. The center span of this structure was 45 feet long and the other two spans were 38 feet long. The centering for the forms was I-beams salvaged from an old railroad bridge. The same contractor mentioned above handled the pouring of this structure in a novel manner. The floor slab and beams complete, containing 355 yards of concrete, were poured at one time between 9 A.M. and 7 P.M. Mr. Hosmer set up two Koehring 27-E pavers, one at each end of the bridge, and delivered the mixed batches into a pair of Stuebner bottom-dump concrete buckets. These were picked up by two Northwest cranes, one stationed at each end, one having a 70-foot and the other a 40-foot boom. The 110 feet of boom did not quite span the entire structure but the concrete flowed sufficiently and was spread by the puddlers so that the missing 11 feet of boom made little difference.

PERSONNEL

On the Taunton River bridge contract J. V. McNeil was Superintendent for Charles I. Hosmer, Inc., and for the Massachusetts State Department of Public Works, Joseph Fenton was Resident Engineer.

Heavy Rock Excavation for an Activated Sludge Sewage Treatment Plant

(*Continued from page 19*)

PERSONNEL

The new North and South Sewage Treatment Plants each have a designed capacity of 6,000,000 gallons daily with plans for doubling their capacities economically when necessary. They were designed by the J. N. Chester Engineers of Pittsburgh, Pa., who were also retained as construction engineers by the city of Lancaster, Pa. This work was under the direction of J. F. Laboon for the consultants with J. H. Miller, James E. Kesner, H. J. Dickman, Andrew Tellefsen and John Sherts as Resident Engineers on both the sewage and water projects. Edward Edgerley is City Engineer of Lancaster. The contractor was Thomas Burke & Co., of Philadelphia, Pa., for whom Bert Senior was Superintendent and Jack Boyer, Engineer.

Highway Grading During Winter Weather

WORKING right through winter weather, with practically no loss of time despite the severest snowstorm of the season, Hemstreet & Bell completed last spring its grading contract on the new road into Wawona and Yosemite National Park by way of Madera, Coarse Gold and Oakhurst. The contract involved grading for 4 miles of road, all in the Sierra National Forest and through very rough country. The formation encountered was chiefly granite, more or less decomposed but frequently hard enough to require breaking with explosives before it could be moved. The job amounted to 125,000 cubic yards.

Two LeTourneau 9-yard Carry-All scrapers on rubber tires handled 68 per cent of the material moved. Where explosives were not necessary to break up the material, a LeTourneau rooter hauled by a Caterpillar Sixty was used. The two scrapers, powered by Caterpillar Sixty-Fives, hauled 85,000 yards of excavation and were then used to complete the grade. The scrapers carried material over an average haul of 600 feet with an average rate throughout of over 90 cubic yards an hour, with a maximum of 120 cubic yards an hour, each. A Caterpillar Sixty with a LeTourneau bulldozer was used to push boulders into place and also in trimming slopes and fills. Cuts ran as deep as 30 feet and fills as high as 60 feet.

The work was done under a Federal Aid appropriation, employment being limited to 30 hours per week for each man. Work consequently was carried on in two 5-hour shifts, six days a week. The project required three months, the lost time being only 7 hours, due to an unusually severe snowstorm.

Analysis of Rigid Frame Concrete Bridges

REMARKABLE progress has been made during the past few years in the analysis of rigid frames of reinforced concrete. Unwieldy procedures have given way to simple and rapid methods and new design tools are available to the engineer. A condensed treatise on modern rigid frame concrete bridges has recently been published by the Portland Cement Association. Data from numerous sources have been collected, coordinated and presented in this booklet of 32 pages. In addition to a detailed analysis of a rigid frame concrete bridge, it also gives a new and simple method of determining stresses in double reinforced concrete sections subject to combined bending and axial thrust; the subject of skew frames is discussed; and charts of coefficients for design and a bibliography are included.

Copies of this booklet may be secured gratis from the Portland Cement Association, 33 West Grand Ave., Chicago, Ill.

The Editor Comments

Mishaps Under the Codes

Presumably created, written and approved to promote fair competition and employment, some of the new codes and regulations relating to the Construction Industry have resulted in most inequitable conditions. Fortunately through the clear-sightedness of some leaders, many of these unjustified restrictions have been eliminated before the codes were approved. Others still dangle in the air ready to hang the unsuspecting signatory of the code, or the workman in whose interests the codes are supposed to be written.

An outstanding example of strangulation of one industry by another occurred in the original National Rules of Fair Trade Practice prepared by the lumber industry. In Section II, Paragraph 4 of Clause A, it specifically ruled out the purchase of lumber by contractors for construction purposes at wholesale rates, even though bought regularly in carload lots, and required them to pay the retail price the same as any man who might want one plank once a year. Fortunately this was fought diligently by members of the Associated General Contractors of America and corrected.

Another upset was discovered in the code which was prepared and presented by the National Crushed Stone, National Sand and Gravel, and National Slag Associations. It was found that this code would prohibit the use of portable stone crushing and portable sand and gravel equipment by contractors. This was only discovered by one or two portable crusher manufacturers who immeditely went to Washington to protest the clauses of the code which would prohibit the use of portable equipment. It was found that the code was almost approved but by presenting a strong case, they secured sufficient time to gather the facts on portable stone crushing and sand and gravel producing industries in the various states to prevent this case of strangulation of an important section of the Construction Industry.

A third example occurred in the code prepared by the National Bituminous Pavers' Industrial Association. In Section VI under the sub-title, "Limitations of Equipment," Paragraph 3, it forbade the establishment of new plants for the production of mixed bituminous paving material, forbade the moving of a plant from one producing site to another, and forbade the increase in normal producing capacity of an existing plant. Thus, a contractor who wished to operate in more than one district was completely hamstrung. We have learned from an authoritative source that this code has been materially changed and has also unfortunately suffered the vicissitudes of being offered under several auspices, but will probably finally appear as a supplementary code under the General Contractors' Code.

And now we come to the individual worker in whose interest codes have been prepared generally. Let us consider particularly the "old hard road man." He has stayed with the contractor year after year. He is a skilled laborer with no permanent residence and hence has not been able to vote in states where personal registration was required. The requirements of the Emergency Highway Construction Acts of the last two years have prevented his continuous employment by the contractor and now under the latest regulations prepared by the Federal Government in the interest of local labor in the districts where the money is being spent, the contractor must choose his labor from that registered by county boards. When the old road man goes to these boards to register they will not accept him because his home is not in that locality and, in fact, he has no legal residence. He has always depended upon his skill and ability on the job to secure his livelihood. As a means of overcoming this most unfortunate condition, the Federal regulations should be altered to permit a contractor to continue in his employment, irrespective of the locality in which he is operating, all men who have been in his employ continuously or as continuously as highway construction permits for three or more years. This would take care of a very large number of men experienced in highway construction and who have contributed much by their skill to our highway system. These men must not become outcasts of the industry. They should be insured the employment which the contractor wishes to give them.

Is the Subgrade Planer Power Equipment?

On most of the jobs we have visited this summer where the work has been concrete paving, the contractor has taken the subgrade planer from his paver and used it on the subgrade ahead of his final grading crew. It has been pulled over the forms and hence is a piece of equipment used between the forms. At first this seemed a violation of the Federal specifications which forbid the use of power equipment or machinery of any kind between the forms. The subgrade planer, however, does not remove any dirt from the grade but merely acts as a very effective checking device.

Theodore Reed Kendall

How the Other Fellow Did It

Ideas That Have Already Proved Helpful to Contractors

Features of a U-Shaped Cement Dock

260. An Iowa contractor took advantage of a pair of parallel spur tracks which were available for cars of bulk cement by building a U-shaped cement dock with the two verticals running along the spur tracks and the cross piece at the bottom being the loading dock for the batch trucks. By running cement from two cars on one track and one on the other, the contractor was able to continue batching the cement for a tandem paver outfit, even though the switching required that the two cement cars on the spur with the aggregate cars were pulled out entirely. The entire dock was double planked to prevent the dropping of cement through any cracks and was built in sections 16 feet in length with five bents per section. These could be easily handled in moving to another set-up. The tracks for the cement carts on the runs were nailed down, completing a continuous platform. The entire cement dock was torn down one afternoon, loaded onto freight cars, shipped to a new location during the night and at 2 o'clock the next afternoon, the entire dock was ready for loading. The runs to the freight cars were set up 9 feet from the center line of the track which necessitated rather long gangways. In handling the cement there were two men per car loading the cement carts and three cars were worked at a time. Two wheelers picked up the carts as they were pushed out from the cars onto the runways and pushed them to the scales. The weigher pushed them onto the scale, checked and corrected the weight and pushed them off. One dumper then pushed the cart to any of the three traps which were empty at the time. The wheelers, as soon as they had left a cart at the scales, went to one of the traps where there was an empty and pushed it back to the car where a full cart was waiting. 24.4.34

Preventing the Miring of Dual Pneumatics

261. Even dual pneumatic trucks sometimes get mired on fills. Any one who has driven off the road where "ball bearing sand" exists knows how quickly the most powerful car or truck digs in. To prevent this, a New England contractor provided a 4 to 6-inch pole about 10 feet long and two men to lay it down on the soft fill for the trucks handling the excavated material to back onto. The pole fitted between the dual pneumatics and held up the truck perfectly. The wear on the tires was nothing compared to the cost of hauling trucks out every few minutes before this method was devised. 25.1.29

Extra Long Skip Tracks for a 2-Bag Mixer

262. Mixers of 2-bag capacity are frequently seen on culvert jobs and many times on bridge work where there is not a need for a tremendous volume of concrete for the pouring of large monoliths. On a job in southern Tennessee, the contractor needed considerable elevation for his 2-bag mixer to increase its chuting range. The mixer was mounted on a 15-foot tower at one end of the structure at about the final level of the roadway so that it was able to pour footings, piers and slab. In order to permit the skip to receive aggregate and cement at ground level, home-made skip tracks about 15 feet long were constructed. There was little lost time in raising the skip as the 25 seconds required for that operation was part of the time that the previous batch was being mixed and dumped. 25.2.27

Lining Up Hand-Rail Forms

263. Various methods are employed by bridge contractors to keep the hand-rail forms in true line so that there will be no irregularities in the completed structure. One bridge contractor showed great ingenuity in furnishing an automatic method for lining up the forms. At about 5-foot intervals along the line of the hand rail, small blocks of concrete 3 x 3 x 11 inches, the latter dimension being the width of the hand rail, were poured on the curb and lined up with the hand-rail posts at each end of the span. When the rail forms were set in place and pulled together against the ends of these concrete blocks, a straight line on the bottom rail was insured without the difficulties involved with string lining in such close quarters. 25.2.28

Setting Premoulded Center Joints

264. There are several well designed and well built machines for setting the longitudinal center strips in concrete pavement. Some make use of a ribbon of approved material and others use premoulded material in the slots. An Iowa contractor developed a unique device for setting the premoulded joint material in strips 8 feet long and 2½ inches wide. The setting machine consisted of a cap just the size of the strip and into which the strip was placed while the machine was set upside down at one side of the double bridge used by the longitudinal float men. The cap was attached to a handle made from an aluminum tube, which was straight for 3 feet at the center and sloped to the ends. Between the first tube and the cap was a second similarly shaped tube with two pin guides to keep it in line. The second tube handle was attached to a strip carried just above the cap and with a series of pins spaced about 4 inches apart which went through the cap. These were used to eject the strip when the device had placed it properly in the slot cut by the wheel on the finishing machine. The two men who used the device were the bull float men. Immediately after floating across a section, they put the bull float in its rest, stepped off the bridge, pushed it forward, and immediately placed a strip of dummy center joint material in the inserting machine. They then took a 2 x 12-inch plank out to the center of the bridge by means of two wires with handles and returned for the inserting machine. The machine was inserted in the slot, the men stepped on the outer section at the two ends to press it firmly into the slot and then put their feet into the inner section and pulled up on the outer section which ejected the strip right in the slot and as straight as a ruler. 25.2.15

The "Merry-Go-Round" Saves Time

265. Time studies by the Division of Management, U. S. Bureau of Public Roads, have shown definitely that where trucks can drive through under a batching plant they save considerable time. While these studies were confined to concrete road jobs, the same applies to bituminous jobs where asphalt plants are used. The superintendent for a New England contractor, who had handled asphalt work for many years, had endeavored unsuccessfully year after year to erect the plant in such a way that it would be possible for the trucks to drive around the plant under the batch box and then straight out. He succeeded in doing this last year and experienced the pleasant result of finding that he needed fewer trucks to haul the batches, because of the shorter time the trucks spent getting under the batch box and out again. 25.1.29

A Contributor to *No. 6*

Construction Progress

ASSOCIATION with men of ability, prominence and action is an inspiration to any young engineer. Early in his career, Arthur C. Tozzer had the privilege of a close contact with Alexander J. Cassatt and recalls it as one of the most stimulating influences of his early life. After graduating from Dartmouth College in 1902 and from the Thayer School of Civil Engineering in 1903 with the degrees of B.S. and C.E., respectively, Arthur Clarence Tozzer, now President of the Associated General Contractors of America and Executive Vice President of the Turner Construction Co., New York, started work with Henry F. Bryant, Engineer, of Brookline, Mass. The first job to which he was sent was the construction of a pier at the Bar Harbor summer estate of Alexander J. Cassatt, President of the Pennsylvania Railroad and father of the idea of the Pennsylvania entering directly into New York City. Mr. Cassatt used to watch the progress of the pier and discuss his own work and life with young Tozzer, giving him a broader vision of engineering and construction as a life work.

Early experience on pneumatic work was secured by Mr. Tozzer while working up from timekeeper to superintendent for the Foundation Co. where he used to get "done up" with bends because of the comparatively unskilled handling of compressed air in relation to health in those days.

Later Mr. Tozzer was superintendent on an experimental tunnel for the Pennsylvania Railroad which was then trying to find a practical and economical way to drive the tunnels through the soft muck of the East River, New York City. The Phoenix Construction Co. had the contract for sinking a shaft and constructing a 7-foot pilot tunnel extending 200 feet under the river. An endeavor was made to freeze the ground around the pilot tunnel with the idea of excavating the frozen ground without the use of compressed air but due to the river current flowing to and fro in the soft muck, it could not be frozen satisfactorily with the refrigeration equipment then available. Hence the scheme was abandoned.

From this work he went with S. Pearson & Sons, English contractors, on the East River, Pennsylvania Tunnels where he was assistant superintendent under Charles E. Fraser, superintendent. (Mr. Fraser is now President of Fraser, Brace & Co., New York.) Mr. Tozzer had charge of two of the headings and built the air locks on all four tunnels. He was one of the few men on the job at that time who had had compressed air experience.

In 1902 the Turner Construction Co. had been organized by H. C. Turner and D. H. Dixon, who surrounded themselves with a group of younger men, all of whom have contributed greatly to the growth of the company which did a business of $40,000 in 1902 and reached a peak of $43,717,000 of construction in 1929, with a total of $374,256,000 from 1902 through 1932. Since the fall of 1905 Mr. Tozzer has been one of this group which is still actively carrying on the Turner policy of furnishing the best in construction. His first job with this company was as superintendent on the construction of the Kenyon factory in Brooklyn, N. Y. Following that

Arthur C. Tozzer

he was in active charge of many of the important construction projects for this company and in 1916 was placed in charge of the newly opened office in Boston. In May, 1918, he was called to New York as Executive Manager for the construction of the great $28,000,000 Army Supply Base at South Brooklyn, N. Y. While on this work he established a record to which he still points with pride and believes still to be a world record, namely, concreting 100 acres of floor in 100 days. The Army Base contract required the pouring of 283,000 cubic yards of concrete. In 1919 he returned to Boston as Vice President of the Turner Construction Co., in charge of the New England Territory, from which office he returned to New York in September, 1928, to fill the newly-created position of Executive Vice President.

Mr. Tozzer is a director of the Turner Associates, Inc., and of Warren Bros. Co., and is a member of the American Society of Civil Engineers, the American Concrete Institute and is an overseer of the Thayer School of Civil Engineering at Dartmouth College.

As President of the Associated General Contractors of America, Arthur G. Tozzer was elected chairman of the National Code Committee for General Contractors which committee is composed both of members and non-members of the Associated General Contractors, and has devoted most of his time in the last few months to this work. The Construction League through its Trade Recovery Committee, of which Mr. Tozzer was a member of its Executive Committee, did much to help put through the Public Works Bill.

Mr. Tozzer has spoken so frequently regarding the working out of the National Recovery Act and has fought so diligently to see that a fair deal under the "New Deal" is possible for all concerned, that he has become one of that group of champions of construction who are doing all in their power to put the Industry in the leading position to which it is entitled. He is helping to build the General Contractors Code and its supplementary Codes in cooperation with the Construction League in such a manner as to strengthen the industry and benefit those whom it serves.

Construction Industry News

American Road Builders Association has announced that it will hold a 1934 Convention and Road Show. The latter will be in the form of a hotel exhibit, the dates, place and other details to be announced later.

Coppus Engineering Corp., Worcester, Mass., has announced the appointment of Frederick D. Rogers, 80 Federal St., Boston, Mass., as its representative in Maine, New Hampshire, Vermont and eastern Massachusetts. This territory was formerly covered from the home office but the increase in business in New England has necessitated the appointment of a representative for this territory. Mr. Rogers will handle the complete line of Coppus blowers, ventilating equipment, turbines, generators and Annis dry-type air filters.

K. B. Noble Co., Hartford, Conn., has recently been appointed distributor for the Caterpillar Tractor Co., Peoria, Ill., in the state of Connecticut and four counties in western Massachusetts. This company, which is now located in a new and larger warehouse at 634 Wethersfeld Ave., will handle Caterpillar tractors, graders, road machinery, generators and parts.

R. G. Le Tourneau, Inc., Stockton, Calif., manufacturer of heavy-duty earth-moving and road-building equipment, has announced the appointment of Denn M. Burgess, formerly with Schramm, Inc., as Eastern Sales Manager. Mr. Burgess will travel throughout the East calling on contractors in the interest of Le Tourneau equipment.

The Day Pulverizer Co., Knoxville, Tenn., manufacturer of pulverizing and crushing machines, has announced the completion of an exclusive sales agreement with the J. D. Adams Co., Indianapolis, Ind., by which the latter company will sell and service the Day traveling jaw-type rock crusher in Arkansas, California, Iowa, Kansas, Michigan, Louisiana, Missouri, Montana, Nebraska, South Dakota, Alabama, Georgia, Illinois, Indiana, Ohio, Tennessee, West Virginia, and part of Arizona, Florida, Mississippi, Nevada, Texas and Wyoming. It has further been announced that this crusher is now available for use with McCormick-Deering TracTracTors, and Caterpillar, Cletrac and Monarch tractors equipped with the rear power take-off.

Hendrie & Bolthoff Mfg. & Supply Co., 1635 Seventeenth St., Denver, Colo., has recently been appointed representative for the Osgood Shovel Co., the General Excavator Co. and the Hercules Co., in addition to the companies they have represented in the past.

Doman & Marks, 101 Court St., Syracuse, N. Y., have announced that after October 1 its engine business will be conducted by the Doman-Marks Engine Co. at Amesbury, Mass.

Marmon-Herrington Co., Inc., Indianapolis, Ind., all-wheel-drive truck manufacturer, has announced that increased business activity has been shown by the sale of three large Marmon-Herrington four-wheel-drive trucks with special equipment for highway construction and maintenance to the Division of Highways of California. The Marmon-Herrington factory is also working on numerous other orders for all-wheel-drive equipment, including a large number from European sources.

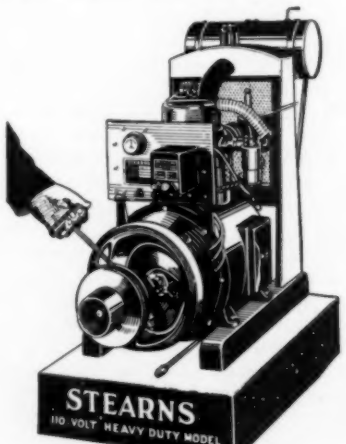
Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill., has lost through death Charles Piez, formerly Chairman of its Board, who entered the employ of the Link-Belt Engineering Co. in Philadelphia in 1889 as engineer-draftsman, working up to become Chief Engineer and General Manager of the Philadelphia works and in 1906, President of a consolidated organization of the three related companies, the Link-Belt Machinery Co., Chicago, the Erart Mfg. Co., Indianapolis, and the Link-Belt Engineering Co., Philadelphia. He continued as President of the Link-Belt Co. until 1924 when he became Chairman of the Board and remained as Chief Executive until February, 1932.

Heavy-Duty Generating Plants

OVERSIZE double-row ball bearings which can not let the armature shaft of the generator drop are an outstanding characteristic of the Stearns generating plant. This design means a smaller clearance between the armature and the pole pieces and the efficiency of the plant is directly proportionate to this clearance. This Stearns generator, which is made by the Stearns Manufacturing Co., Adrian, Mich., has four large brushes, the tension on which is controlled by a well-built adjustable device. Other features include bronzed back connecting rod bearings, overhead valves completely enclosed and vapor oiled, a Schebler carburetor with return of the fumes from the crank case to the carburetor, a Bosch magneto, a generous size radiator, a gasoline tank containing a dirt-proof screen with needle valve shut-off, a knife gage for the oil crank case, and all gears in the crank case silent and of helical cut.

The engine is the slow speed 4-cycle type, consuming less than one quart of gasoline per hour. Three horsepower may be taken from the pulley mounted on the end of the armature shaft. This generator will drive up to 2-hp electric motors. If the load to be drawn on these plants never exceeds the rated capacity and if it is agreeable to start the generator with a crank, it is not necessary to use batteries. When batteries are used, then the standard plant is started and stopped with a push button control. A knife switch on the control board, when opened, causes the generator not to function and the full power is delivered to the pulley on the armature shaft. If less than 3 horsepower is demanded at the pulley, then a pulley drive may be used at the same time the generator is functioning.

At a slight additional cost, a semi-automatic control board can be furnished, causing the plant to start automatically whenever a load of 300 watts or more is thrown on the line and to stop when that load is taken off.

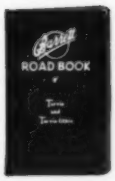


A Heavy-Duty Portable Electric Plant

Barrett Tarvia

GOOD ROADS at LOW COST

Tarvia surface treatment at Cullman, Alabama



Write for your copy of this Barrett Road Book containing useful information on the proper use of Tarvia and Tarvia-lithic.

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THE BARRETT COMPANY, Ltd.
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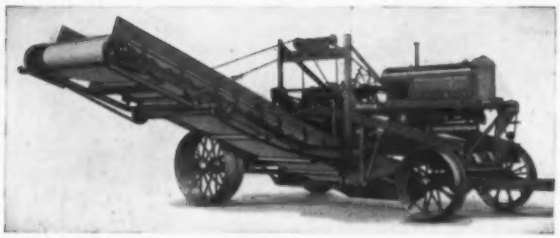
Postponing needed road improvement merely increases the expense to all concerned. Poor roads save no one any money, or time. There is no calculating what they cost business and farmers in lost profit and opportunity—or taxpayers and motorists in inconvenience.

Take advantage of the few remaining weeks before winter sets in. Whether you have new roads to build, old roads to surface or widen, or patching to be done, there is always a fast and economical way to do them with Tarvia. Tarvia economy includes low first cost and low upkeep, as well as speed of completion.

Tarvia is made only by The Barrett Company, America's oldest and most experienced manufacturer of coal-tar road-building materials. All of Barrett's unmatched facilities for prompt delivery and dependable service are available to you through the Tarvia field man. 'Phone, wire or write our nearest office.



The New Austin Contractors' Special Elevating Grader

A Special Elevating Grader with Hydraulic Control

AN elevating grader with better balance, great flexibility, an output exceeding previous models and with various improvements and refinements of design has been announced by the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill., in its new Austin Contractors' Special elevating grader. Both plow and carrier are operated by hydraulic power controls which consist of but seven moving parts, and these always work in oil. A cross-over drive chain on the carrier prevents injury to either the equipment or wagon operator. The carrier head drum is of one-piece steel covered with vulcanized rubber lagging to reduce wear. This drum may be exchanged, when that becomes necessary, for a new one, credit being allowed for the old drum. To assure flexibility and balance, rubber mounting and cushions are provided at strategic points in the main frame. An arched H-beam frame retains the true arch so necessary to provide both extra clearance for the load on the carrier and to keep the center of gravity of the machine at the lowest possible point. The front rails of this arch are widely separated and mounted on a spring platform which permits greater vertical and horizontal oscillation of the front end. The front wheels can be turned at greater than right angles for quick and easy changing of the direction of the machine.

The carrier, which is equipped with anti-friction bearings, is provided with an automatic spiral pan cleaner which prevents dirt from clogging and acting as a brake on the belt. The 42-inch machine is equipped with a Buda K-325, 6-cylinder removable sleeve motor, developing 49 horsepower at 1,200 rpm and the 48-inch machine is equipped with a similar Buda K-369 motor, developing 53 horsepower at 1,200 rpm. The motors can be equipped with battery, starter and distributor ignition. Tail lights and head lights can also be provided for night work. The 48-inch machine is provided with an extensible rear axle which can be extended 18 inches to increase the stability of the machine when extra long carriers are used.

A Cart-Type Bituminous Distributor

THE cart type of bituminous distributor has attracted considerable attention as it enables a municipality or contractor to use plain tanks for hauling bituminous materials, and then couple up with the cart-type distributor for application of the material to the road.

A new bituminous Applicator of this type announced by the Rosco Mfg. Co., 928 S. Fourth St., Minneapolis, Minn., retains the features of standard Rosco distributors such as the 7-way valve, the folding spray bar, and pressure control. A special feature of the Applicator is the Rosco leveling device which enables the operator on the rear platform to quickly and easily regulate the height of the spray bar to conform immediately to the changes that take place when hooking up to various sizes of trucks operating on the same job. This leveling device is controlled by a hand wheel within easy reach of the Applicator operator. This machine is recommended only for road oils, cut backs and emulsions, the standard units with burners and insulated tanks being recommended for heavy penetration materials.

The Rosco Applicator is powered with a 4-cylinder radiator cooled engine and has a rotary, internal gear-type pump. It has a steering device similar to that of a construction grader which permits offsetting the trailer 6 feet, center to center, but keeps the spray bar always transverse to the road. In this way the trucks may travel on the hard center of the road, allowing the Applicator to work on the soft shoulders or in the loose material.

A New Diesel Engine of Simple Design

A NEW diesel engine of monovalve construction, using only one valve per cylinder and permitting the use of the conventional L-head design, has recently been developed by the American Diesel Engine Co., Oakland, Calif. This new 4-cylinder engine operates at a rated speed of 1,200 rpm and developes 75 horsepower at this speed. The fuel consumption at this horsepower is 0.44 pounds per horsepower hour. Since the torque curve of this engine is so flat and the fuel consumption so complete, it is practicable to run this engine over a speed range from 200 to 2,000 rpm and still get a clear exhaust and a fuel consumption of less than 0.5 pounds per horsepower hour.

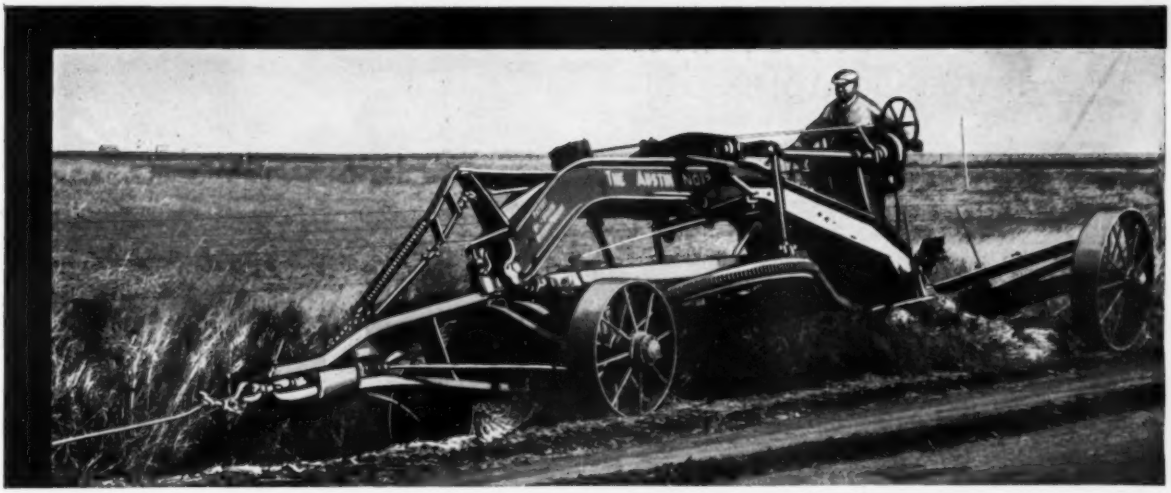
This means that the Model 4-75 offers an available horsepower ranging from 35 to 125, covering a number of power applications. These engines are being built for automotive and marine installations and for stationary power purposes.

Special Floodlights for Night Work

PORTABLE chromium-plated floodlights mounted on specially designed tripods which have been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., are used to facilitate night work on San Gabriel Dam No. 1. This is part of the $8,000,000 five-year project of the West Slope Construction Co. for the Flood Control Bureau of the County of Los Angeles, Calif. The illustration shows one of the fleet of new 20-cubic yard trucks dumping rock and gravel taken from the excavation for the dam foundation.

These Westinghouse lights can be carried by one man and placed exactly where needed, the tripod readily adapting itself to the steep mountain sides or rough terrain.

One of the Westinghouse Tripod Floodlights Furnishing Light for Night Work on the San Gabriel Dam



WHAT A DIFFERENCE *these* PLUS FEATURES MAKE . . .

- **Straight Line Delivery of Power — Upper hitch member pulls direct on king pin casting, lower hitch pivoting on lower axle member—King pin casting directly joined to circle by Z-bar draft beams.**
- **One Piece Electric Welded Frame for Greater Strength, Flexibility and Visibility.**
- **Double supported Ball and Socket Joints throughout for easy elimination of lost motion.**
- **Three Types of Control—complete hydraulic, complete hand, or hand combined with automatic wheel leaning.**

WHEN you think of road graders certain standard requirements are in your mind. When you think of Austin-Western Graders, add this *plus value*—Straight line delivery of power to the blade at maximum efficiency.

In no other road grader will you find draw bar pull so directly converted into blade power. Skilfully engineered features contribute a positive saving of energy otherwise diffused before it reaches the blade. The practical mind can readily appreciate the influence of such construction and design in lowering costs—reduced fuel expense, greater tractor efficiency, increased operating speed, slower depreciation.

Let an Austin-Western representative explain how each point adds its bit to the excellent performance record of this machine. Or, better still, send coupon below for illustrated descriptive bulletins.

The Austin-Western Road Machinery Co., Home Office: 400 N. Michigan Avenue, Chicago, Ill. Branches in principal cities.

85 YEARS OF LEADERSHIP IN ROAD MACHINERY

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ROAD ROLLERS CRUSHING & SCREENING PLANTS SCARIFIERS SWEEPERS & SPRINKLERS, ROAD GRADERS, ELEVATING GRADERS MOTOR GRADER DRAGS, SHO... WAGONS, SNOW PLOWS.

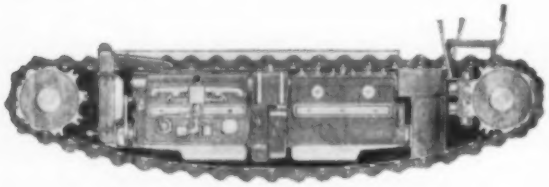
The Austin-Western Road Machinery Co.
400 N. Michigan Ave. Y, Chicago, Ill.
Send complete information on ☐ Austin Contractor's Special, ☐ Western No. 6, ☐ Western Crawler Wagons.
Name .....
Address ..... State .....
City ....US DISTRIBUTORS

During October we hope you will remember to mention CONTRACTORS AND ENGINEERS MONTHLY.

A Self-Propelled Crawler-Mounted Compressor

A COMPLETE self-propelled engine-driven crawler-mounted air compressor, known as the Trac-Air compressor, has recently been announced by Schramm, Inc., West Chester, Pa. The entire unit is mounted on a one-piece steel frame, simplifying assembly and permitting its removal from the Trac chassis for use as a stationary unit. The chassis is made of frame pieces and is housed on the sides and bottom with ½-inch heavy steel plate. The ends and side doors are supplied with louvres to give a free flow of air through the outfit. All parts of the unit are easily accessible because of removable sliding doors on the sides. The heavy gage metal top is swung open while running or while adjustments are being made.

The endless traction treads run on heavy cast steel sprocket wheels and the tread rollers run on steel tracks. The two rollers on each tread assure an even, easy motion. These treads are each 8 inches long and 8 inches wide. The adjustment of the traction tread is by means of the adjustable front sprocket axle which may be easily moved by turning one adjusting screw on each side of the chassis.



The Schramm Trac-Air Compressor

Power for propelling the unit is secured from two powerful reversible air motors that drive to the traction tread by means of an alloy steel roller chain. The speed of the motors and the steering of the outfit are controlled by two levers conveniently located on both sides of the driver's seat, which is placed in a position to make riding over rough ground as comfortable as possible. An average speed of 1 to 1½ miles per hour can be maintained, either forward or reverse, and the turning radius can be confined to a very small area.

Schramm compressors which may be secured in this unit are the 120, 240 and 360-cubic foot models, powered with Buda engines. Both the compressor and the driving engine are equipped with standard oil filters and Air-Maze air cleaners to cleanse ingoing air. Silencing devices on the air cleaners and a heavy-duty muffler on the engine exhaust assure operation with the least possible noise.

A New Light-Weight Full-Diesel Shovel

THE Speeder D4, a new light-weight convertible full-diesel shovel, has recently been announced by the Speeder Machinery Corp., Cedar Rapids, Iowa. This machine is rated at ⅝-yard capacity for shovel, crane, dragline or pull-shovel work. It is powered with a Caterpillar diesel engine and the operation costs for fuel for this motor is about 10 cents per operation hour.

The crane and dragline booms are 35 feet in length, the shovel boom is 18 feet long and the dipper stick 14 feet in length. As a shovel it is equipped with either a standard Speeder bucket for bank or subgrade work or a manganese bucket for rock work. The mechanism of the Speeder D4 is very simple, there being only nine spur gears in the entire machine and every working part is accessible without dismantling. Shafting has been increased in diameter and gear faces have been increased. A Morse lubricated silent chain 5 inches in width and only 34 inches in length from center to center transmits the power from the motor to the mechanism. The travel gears are heat-treated and run in an oil bath. All shafts are dead end and no shafts revolve in the drums, thus allowing both shaft and drum to stop the moment their specific function is performed. The crawlers of the shovel are of the new Speeder lug-driven friction-free type.

The Speeder D4 Convertible Shovel Which Is Powered With a Caterpillar Diesel Engine

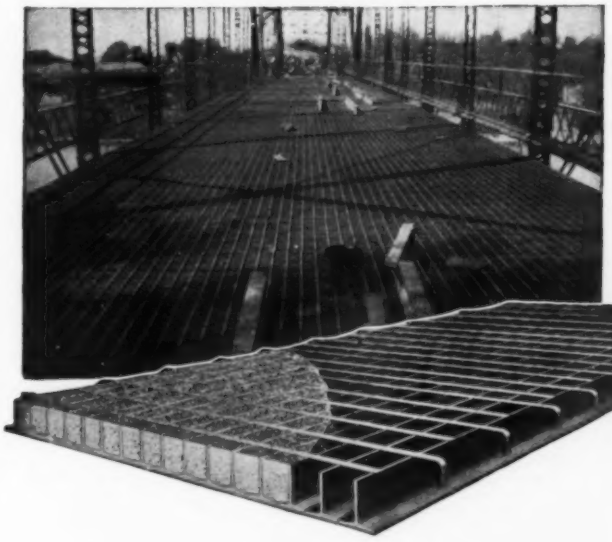
A New Spiral Scarifier Which Digs and Mixes

A SIMPLE inexpensive unit for scarifying old roads in preparation for resurfacing and for many other purposes has been developed by the Moritz-Bennett Corp., Effingham, Ill. This Moritz spiral scarifier digs to any desired depth, cuts a smooth bottom surface, chews up the scarified material whether it be on old or new roads and turns and mixes the materials. This last feature is very important when mixing oiled surfaces on secondary roads. Road surfaces scarified with this machine are so completely broken up that they absorb oil rapidly, preventing run-off and waste.

The scarifier excluding the tractor hitch is 12 feet long, the spiral is 18 inches in diameter and it is 7 feet extreme width.

The New Moritz Spiral Scarifier

TEEGRID (PATENT APPLIED FOR) Bridge Floors



Rapid erection—greater rigidity—no forms required—steel armored wearing surface—cross bars pressure welded to tees with no reduction in area—triangular bars hold concrete positively in place—girders, stringers and Teegrid slab become a homogeneous steel diaphragm to resist distortion stresses.

Write for the Teegrid Handbook.

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Napier Avenue Bridge, St. Joseph, Mich.
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LAMBERT-NATIONAL HOISTS: STEELE & CONDICT MACHINERY
McKIERNAN-TERRY DOUBLE ACTING PILE HAMMERS

A New Portable Platform Scale

The Kron Portable Platform Scale

A NEW portable platform scale with a platform 21 x 29 inches, so designed that the platform plate does not overhang the suspension loops and therefore permits extreme loads to be placed on the edge of the platform without disturbing the accuracy of the scales, has been announced by the Kron Co., Bridgeport, Conn. Another feature of the platform is that the levers have no lateral movement.

This scale is built with four-wheel construction, the wheels being made of Bakelite and rubber. However, if desired, three-wheel construction can be furnished and the scale fitted with a handle for easy portability. The standard Kron improved ball bearing one-cam translation mechanism is part of the regular equipment.

A New 6-Cylinder Motor Roller

A NEW motor roller, an important feature of which is an entirely new method of mounting front rolls and yoke on a spring-mounted king pin and the spring-mounted engine and transmission which includes differential, bull gears and rear axle, has recently been announced by the Galion Iron Works & Mfg. Co., Galion, Ohio.

Operation is easily handled by one man without his leaving the operating platform. The master clutch lever, the forward and reverse clutch lever, the hand brake lever, the gear shift lever, the differential lock lever, the scarifier lever, together with the engine controls and indicating dials are located close to the steering wheel. The steering device is of the hydraulic type. An extra large and powerful hydraulic cylinder is located in the king pin head casting at the front of the frame and the piston rod of this cylinder is directly connected to a steering arm which is splined to the top of the king pin and permits the free movement of the spring-mounted king pin. The flow of oil to the steering cylinder is through a piston-type valve. The dash steering control is an automotive type steering wheel which drives a spiral cam which operates the piston valve. Only a slight turn either way is necessary to open the valve. The hydraulic steering device is claimed to be powerful enough to turn the front wheels even when standing still and in soft material. It is also stated that the roller will turn in a 33-foot circle, or will turn in an 18-foot roadway by backing once.

The engine is a heavy-duty industrial-type 6-cylinder gasoline engine which develops 58 hp at 1,200 rpm and is equipped with the following accessories to insure long life and economy of operation: down-draft carburetor, Vortex oil-type air cleaner, governor adjusted from the dash through a speed range from 700 to 1,200 rpm, a distributor for battery ignition, and a fuel pump which makes it possible to place the fuel tank at the rear of the frame under the operator's platform. An electric starting motor and generator are also standard equipment. The roller is made in two sizes, 10 and 12 tons. The wheelbase is 10 feet 6 inches, and the rolling width 6 feet 4 inches with 20-inch rolls. The length overall with the scarifier is 18 feet 8 inches, without the scarifier, 17 feet 2 inches, and the height overall, 6 feet 6 inches.

Sectional Plate Pipe for Drainage

SECTIONAL plates so fabricated that they may be readily assembled into various cross-sectional shapes such as ovals, circles and arches, and applicable to drainage construction under many varied conditions, have been developed by Toncan Culvert Manufacturers Assn., Republic Bldg., Youngstown, Ohio. Toncan Sectional Pipe is made of Toncan copper molybdenum iron plate furnished in standard corrugated sections or plates in gages running from No. 7 to No. 1 and so designed that all plates of like dimensions are interchangeable during the erection process. They are punched along the longitudinal edges to receive ⅝-inch diameter bolts in the crest and valley of each corrugation, the holes being staggered in rows 2 inches apart. The corrugations are 6 inches from crest to crest and are 1½ inches deep.

Each plate is corrugated, punched and curved before being galvanized by the hot dip method, where a coat of 3 to 5 ounces of prime western spelter is applied to each square foot of double exposed surface, a 3-ounce coating being guaranteed.

The plates are furnished in nominal lengths of 5, 7½ and 10 feet and when properly staggered permit the erection of continuous structures without continuous circumferential or peripheral seams. Irrespective of gage number, or of the cross-sectional shape of the structure in which they are to be used, standard corrugated plates, when erected, lap a minimum of 4¾ inches in the longitudinal seams and 4 inches in the staggered peripheral or circumferential seams of a culvert. Because of this, heavier gage plates may be used in the bottom than in the balance of a pipe if desired.

All standard plates are of the same width, and when a plate is lapped along both longitudinal edges by adjoining plates it will form 47.12 inches of the circumference or perimeter of any structure or pipe. The galvanized Toncan bolts have a combination head and washer forged to fit the valley of a corrugation and the hexagonal nut supplied is the regular ⅝-inch American standard. Bolts are furnished in two lengths, optional with respect to the gage of the plates, one being for two, the other for three thicknesses of metal.

Toncan Sectional Pipe is shipped in a knockdown condition, with the plates nested and the bolts and nuts boxed.

Erecting the Side Plate of a 60-Inch Diameter Toncan Sectional Plate Pipe

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When you use the ETNYRE Model "F" Distributor, you need have no fear concerning the absolute accuracy of distribution and, in addition to this accuracy, you have the simplest operating mechanism and a machine that will heat and apply material at the lowest cost per gallon.

ETNYRE accuracy has made better black-top roads possible.

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OREGON ILLINOIS

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makes *Good* Paving *Better*

The "sandwich" joint which protects concrete paving against expansion and contraction stresses. Proved by 20 years' use in highways and sidewalks in all parts of the world. Large stocks in principal cities insure immediate shipment. Write for catalog and 1933 prices.

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F. O. B. Factory buys 10,000 Gallon Size Complete.

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Cost Reducing---- DIRT MOVING EQUIPMENT

BLAW-KNOX (ATECO) HYDRAULIC DIRTMOVER
Yardage costs of $.0495 per cubic yard, and lower, are a matter of common record on **DIRTMOVER** equipped jobs. We can tell you about contractors who are making real money on all kinds of dirt moving and grading work.

BLAW-KNOX (ATECO) HYDRAULIC BULLDOZER
Rigid box type construction—light weight—two way control—easy and quick to put on—positive downward pressure on the curved digging bowl—speedy bulldozing. Can be used in combination with the **DIRTMOVER**, as illustrated.

BLAW-KNOX (ATECO) TAMPING ROLLER . . . .
Rolls and tamps as you fill—kneads and ties each layer together, thoroughly compacting the fill. Can be used in combination with Blaw-Knox (Ateco) Hydraulic **DIRTMOVER**, as illustrated.

Send for Catalogue No. 1372, DIRTMOVERS; No. 1354, BULLDOZERS; No. 1483, TAMPING ROLLERS . . . They will be sent at your request.

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An Air Cleaner for Gas Engines in Construction Service

The Handy Perfection Air Cleaner

AN air cleaner of the oil wash type has been developed for use on engines in trucks and road building equipment by the Handy Governor Corp., Cleaner Division, Detroit, Mich. The Handy Perfection air cleaner takes the dust and abrasives out of the air and reduces the grinding and wearing out of engine parts. The air duct or intake channel is completely submerged in the oil reservoir. No air can pass into the cleaner without displacing and violently agitating the oil in the air channel. The oil is circulated as a heavy fog in the washing chamber and removes all of the dirt, no matter how fine. The oil in the air channel is continually replaced from the main reservoir through a slot in the lower wall of the air channel. A condenser above the washing chamber traps the dirt-laden oil and returns it to the reservoir where the dirt precipitates and the oil becomes ready for recirculation. The reservoir is of large capacity and holds from 2 to 4 quarts of oil and from 3 to 5 pounds of dirt.

It is claimed that because of the intense washing action and the active circulation of the oil, no clogging of the condensing element can occur, nor does it ever require cleaning. This cleaner is oversize in air capacity and has very low restriction. Therefore its application does not reduce engine horsepower or increase gas consumption.

To service this cleaner there is nothing to do but dump the accumulated dirt once a month. No oil is consumed in the operation although it may be lost by overflow. The oil rises in the reservoir as dirt is accumulated until it overflows, which is an indication that it should be detached and the dirt dumped out. In ordinary operating conditions this is not necessary more than once in thirty days.

A New Lubricant

A NEW lubricant has been developed in which metallic lead is the protective element. The lead has been broken down into such finely divided parts as to be virtually a soluble or liquid lead within a lubricant vehicle. The new product, known as Bestolife, forms a thin protective film of lead on all contacting surfaces which changes such surfaces to a continuous unbroken, anti-frictional area, according to the manufacturer, Armite Laboratories, 1450 East 61st Street, Los Angeles. The lubricant has a pure metallic lead base instead of lead salts and is said to be free from chemical reactions. The minimum constituency of lead in Bestolife is 15 per cent, ranging up to 65 per cent, and is claimed to withstand temperatures up to 430 degrees and will not entirely lose its lubricating stability until the melting point of lead is reached, which is 590 degrees. The principle application of the product in the construction field is for use as a chain lubricant, also for rollers, pump packing and belt dressing. It is also being used with unusual success for wire lines and slow speed gears.

Establishment of a National Weld Testing Service

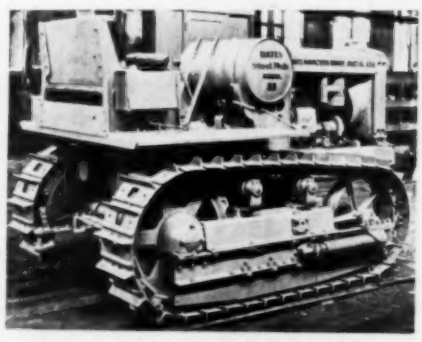
A WELDING division has been organized by the Pittsburgh Testing Laboratory, Pittsburgh, Pa., to render six types of service: reports on welding processes, when such reports are necessary to comply with specifications, codes or rules or to obtain insurance on the product or structure; reports on weld specimens which are made prior to construction; reports on weld specimens which are made during construction (qualifications of welders); laboratory tests of weld specimens which are submitted to the Bureau for test, and on which the Bureau's representatives have no knowledge of the process used or the details involved in welding the specimens; inspection of welded products and structures independently of or in conjunction with their weld testing services, depending on regulations governing the inspection of the product or structure and on the requirements of clients; and investigation of special welding problems when this type of service does not conflict with the company's neutrality and impartiality.

This new division, which is called the National Weld Testing Bureau, has no promotional interest in any particular welding process. It will have its headquarters in Pittsburgh and will be in charge of James W. Owens as Director.

A New Tractor with an Oil-Burning Engine

A NEW track-type tractor powered by a 4-cylinder Waukesha Hesselman oil-burning engine has recently been announced by the Bates Manufacturing Co., Joliet, Ill. The engine used in this Bates 35 tractor burns any fuel that a diesel engine will handle, as well as other fuels which can not be used in a diesel, such as fuels of high self-ignition temperature. The fuel is metered into the engine with a high pressure Bosch ignition pump injecting through Hesselman injectors which throw the fuel into a rotating air stream in the cylinder. Here the fuel is mixed with the air. At this point, ignition is accomplished by a special spark plug. This feature eliminates the necessity of employing an auxiliary engine to start the main power unit.

This Bates oil-burning tractor is equipped with either 12 or 14-inch wide tracks and has three forward speeds, 1¾, 2¾ and 3¾ miles per hour and 1¾ miles per hour in reverse. It has the same characteristics as the gasoline-motored tractor, having full clutch steering without differential and a swinging drawbar mounted ahead of the sprocket wheel center to offset side draft. The swinging crawlers react entirely on a chassis frame without any attachment to the motor and adequate anchoring is incorporated to insure no side springing of the crawler frames. The length of the unit is 120 inches, height 70 inches and width 72 inches, with a ground clearance of 12 inches.



The New Bates Tractor Powered by an Oil-Burning Engine